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**THE MUSEUM**  
**of**  
**FAR EASTERN ANTIQUITIES**  
(Östasiatiska Samlingarna)  
**STOCKHOLM**



**Bulletin N:o 10**

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Stockholm 1938





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# FAR EASTERN GLASS: SOME WESTERN ORIGINS

BY

C. G. SELIGMAN AND H. C. BECK

## PROLEGOMENA

We should like our paper to be regarded as one of a series dealing with early contacts between Europe, including the Roman Orient, and the Far East. The conclusions arrived at in an earlier paper, namely that the socketed celts and bird-chariots of China were derived from European prototypes, had made us eager to discover whether there were not other groups of objects found in the Far East whose origins could be referred to the European area.<sup>1)</sup> We knew that Sir Aurel Stein had found evidence along the trade route of exports from the Near East at a later date than that of the bronze socketed celt; we also knew that glass was traditionally of western origin and supposedly not made in China earlier than the fifth century A. D. Glass of the Roman Orient dating from the early centuries of our era had recently been found in Korea in graves of the Silla period, and it was this that led one of us, when in the Far East in 1929, to collect glass or glazed beads that might on *prima facie* grounds be attributed to any period not later than the tenth century. A small collection of such beads was made, and the results of our preliminary examination were communicated to the First Congress of Prehistoric and Protohistoric Sciences, held in London in 1932.<sup>2)</sup> We have since that date been able to add considerably to our collection of early beads and glass objects from China, and this paper is largely based on these specimens.

Reference to our earlier paper will not only show its tentative character, but that we did not offer any chemical evidence as to the nature of the glass of which our beads consisted, nor of the glazes used. It seemed unlikely that any considerable progress would be made until at least some of the many chemical questions suggesting themselves had been dealt with. A few preliminary analyses, for which we are indebted to Mr. J. H. Cooke, led to one important conclusion, namely the presence of barium in considerable amount in Chinese beads that archaeologically could almost certainly be referred to the Han dynasty or even earlier. Owing to his skill and experience Mr. Cooke was able to use ordinary quantitative

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<sup>1)</sup> C. G. Seligman, 'Bird-Chariots and Socketed Celts in Europe and China', *Journ. Roy. Anthropol. Inst.*, Vol. L, 1920; the western origin of the Chinese bull-headed rhyton was demonstrated in *Custom is King; Essays presented to R. R. Marett on his seventieth birthday* (1936). See also footnote p. 37.

<sup>2)</sup> H. C. Beck & C. G. Seligman, 'Early Chinese Beads of Foreign Type', *Proc. First International Congress of Prehistoric & Protohistoric Sciences*, London, 1932 (Oxford University Press, 1934). A further communication to the same body was made at its Oslo meeting in 1936.

gravimetric methods on surprisingly small amounts of material; it was, however, realized that it would not be possible to analyse every bead or piece of glass whose composition we wished to discover. It was then that we had the good fortune to enlist the interest of Professor W. G. Constable, lately Director of the Courtauld Institute of Art (University of London), and of Dr. P. D. Ritchie, formerly Head of its Scientific Department. Dr. Ritchie most kindly examined spectrographically a large number of beads and glass objects, and it would be difficult to over-estimate the help he has rendered us or the importance to us of the chemical results he has enabled us to apply to our archaeological material.<sup>3</sup>) We are also greatly indebted to Dr. F. M. Brewer for the spectrographic examination of another series of specimens. Another friend to whom we owe much is the Right Reverend W. C. White, formerly Bishop of Honan, now Keeper of the Eastern Asiatic Collection of the Royal Ontario Museum of Archaeology, Toronto. It will be obvious as the paper develops that his assistance has been constant and of the greatest value, indeed much of our material is due to his generosity and scientific acumen. With Bishop White's name we naturally link that of Professor C. T. Currelly, Director of the Royal Ontario Museum of Archaeology, to whom our obligation is no less.

We gratefully acknowledge the assistance we have had from Mr. L. C. G. Clarke, who placed at our disposal the collection of Chinese beads in the University Museum of Archaeology and Ethnology, Cambridge. Professor J. G. Andersson of the Museum of Far Eastern Antiquities, Stockholm, generously lent us several particularly interesting specimens, and these were supplemented by a number of specimens from his collection graciously put at our disposal by H. R. H. the Crown Prince of Sweden. We also desire to express our thanks to Messrs R. L. Hobson, Bernard Rackham, W. A. H. King, D. B. Harden, Lionel Giles, and W. B. Honey, to Professors W. P. Yetts, P. Jacobsthal, Jiro Harada, and P. Newberry, Professor and Mrs. J. D. Beazley, Dr. Leonhard Adam, Dr. Nils Palmgren, and to Mr. W. A. Smallcombe, Curator of the Reading Museum, for various forms of advice and assistance.

We should in addition like to thank Messrs Bluett and Sons, S. M. Franck and Co., E. Gutmann, C. T. Loo, and H. R. N. Norton, for the loan or gift of specimens, though not all these figure in the following pages. The editor of *Antiquity* has kindly allowed us to reproduce text figures 3 and 7. Many other friends have assisted us with advice, the loan of specimens, or the gift of photographs; we can only hope that we have not failed to acknowledge our indebtedness for these in the body of our paper.

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<sup>3</sup>) Some of Dr. Ritchie's spectrographic analyses have recently appeared in *Technical Studies in the Field of the Fine Arts*, Vol. V, 1937, under the title 'Spectrographic Studies on Ancient Glass, Chinese Glass from pre-Han to T'ang times'. The tables he publishes are to some extent identical with those appearing at the end of this paper (pp. 51—56).



It will be convenient at the very beginning of our paper to indicate what is meant by »glass», and to point out the differences between glass, glaze, and faience.

Glass, glaze, and faience are all made of similar materials; their chief constituent is silica and they all contain lime. Glass and glaze always contain soda or other alkali, whilst small quantities of soda are usually present in faience. In ordinary modern European glass, 6% to 10 % of lime, 15 % to 20 % of soda, and the balance silica, is a common formula. In faience, however, the proportions are very different; the silica varies from 94 % to 99 %, the lime is generally about 2 %, whilst the soda when present is often from  $\frac{1}{4}$  % to 1 %.

Although glaze and glass are frequently identical chemically, they are worked and used differently. Both are isotropic, and therefore do not change the colour of light passing through them when viewed in a polariscope. Glass objects are generally made entirely of glass, whilst glazed objects consist of one or more layers of glaze applied to a core or base of other material.

Glass is made by heating the ingredients in a crucible until they fuse into a liquid, which is either poured into a mould, pulled out as threads when in a plastic condition, or allowed to cool and then broken from the pot. Faience, on the other hand, is moulded to shape as a powder, lightly held together with some liquid such as milk of lime, and then heated until the lime or soda has sufficiently fused to cement the mass firmly.

Glaze, which, as we have seen, is closely allied to glass, has been used extensively from the fourth millenium B. C. in Egypt (Badari) and Mesopotamia (Jemdet Nasr), and from an early date in the Aegean. The manufacture of glass is much later, but there is conclusive evidence that it was occasionally made before 1 500 B. C. We cannot say whether glass was first made in Egypt or Mesopotamia, but it did not come into anything approaching general use until about 1 500 B. C. in Egypt and perhaps 1 700 B. C. in Mesopotamia.<sup>4)</sup>

The process of blowing glass was not discovered until long after this, and it is an interesting comment on our ignorance of origins that both the time and place of this invention, which entirely altered the glass industry and in some respects may be thought to have made a real difference to the amenities of life, should be unknown. The date, however, was probably rather before the commencement of the Christian era, and allowing for our very incomplete knowledge the invention may have originated in the Eastern Mediterranean area.

A few of the beads found in China may consist of a material that when found in Egypt and Mesopotamia is known as frit. This material is in its pure form a double silicate of copper and lime ( $\text{CaO CuO } 4\text{SiO}_2$ ). Messrs A. P. Laurie and colleagues (»Egyptian Blue», *Proc. Roy. Soc.*, A. 89, 1914, pp. 418—429) have shown that this material is pleocroic (appearing differently coloured according

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<sup>4)</sup> H. C. Beck, »Glass before 1500 B. C.», *Ancient Egypt and the East*. June 1934, pp. 7—21.

to the angle at which it is viewed) and can only be formed between the temperatures of 800° and 900° C., also that it is frequently found combined with other quartz or glass-like materials derived from the excess of silica. The pure form is rather friable, but when combined with silica it makes a much harder material and physically resembles faience, though it contains no lime. While it is easy to recognize a material as pure frit, it becomes difficult to distinguish frit from faience when there is an excess of silica.

If a batch of glass mixture — commonly called »pot-metal» — be not sufficiently fired to melt all the quartz completely, a material is produced which can be worked as glass but which when examined under the microscope shows anisotropic quartz grains embedded in an isotropic base. A number of our specimens consist of such optically »incomplete» glass; in discussing these we shall, however, speak of them as glass, since they look like glass and were obviously regarded as such by their makers. Moreover we have had no difficulty in distinguishing these specimens from faience.

Lead glass, the so-called flint glass so common at the present day, is little known before the Christian era; its earliest date is still in dispute. Several of our Chinese specimens are excessively heavy and contain lead; some also contain barium, though the heaviest glass we have examined contains no barium but much lead. Ordinary glass of the soda-lime-silica or potash-lime-silica type has a specific gravity of about 2.2 to 2.4, while several of the Chinese beads have specific gravities of between 4 and 5. This implies that the glass must contain as much as 70 % of lead oxide. As far as we can discover, the only place outside China where such beads have been found is in the district of Rhodes,<sup>5)</sup> in the Aegean. Among the heaviest Chinese lead glass that we have seen is that constituting the Buddhist amulets shown on Plate VII; one of these (No. 6 b) has a specific gravity of 5.75. Although we have been unable to discover in literature other specimens of early western glass containing a high proportion of lead, we have ourselves tested a piece of Egyptian glass of unknown date, though probably pre-Roman, provided by Sir Flinders Petrie, which contained a considerable amount of lead.<sup>6)</sup>

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<sup>5)</sup> We say »district», since with Rhodes we would include the neighbouring islands. Mr. Cooke found almost 70 % lead oxide in a bead from Rhodes having a sp. gr. of 5.19 (p. 11).

<sup>6)</sup> Neumann and Kotyga have examined glass of eleven different colours from Tell el Amarna (Egypt, c. 1350 B. C.). Lead was only found in one specimen, a leaf-green, and then only rather less than half of one per cent, an amount so small that the glass containing it can hardly be considered a lead glass. The red glass analysed by Neumann (*Zeitschrift für Angewandete Chemie*, 1925) had no lead, and of 7 pieces of red cuprous oxide glass from Tell el Amarna that we have ourselves tested none showed more than the merest traces of lead. Glass of pre-Roman date containing more than a trace of lead is almost, if not completely, unknown apart from these Chinese beads and the few similar beads from the Aegean. The fact that so many of our beads with a high lead content were, as we shall show, probably made in China suggests a Chinese origin for glass containing lead, an invention that had far reaching results in the manufacture of glass.

Even lead glaze is rare at an early date; the earliest is reported from the 22nd Dynasty (about 700 B. C.), recorded by Mr. Lucas, but this specimen is said to have very little lead. Two other instances of lead glaze are cited by the same authority between Dynasties XXII and XXV, but out of twenty-nine specimens of Ptolemaic or Roman date only four showed any trace of lead.<sup>7)</sup>

## AIMS AND METHODS OF INVESTIGATION

As our title indicates, the purpose of this paper as first conceived was to discuss contacts of the West and the Far East as indicated by the presence of glass of western origin, or of glass that bore evidence of western influence in the Far East. Although we have in the main adhered to our programme, we have thought it useful to add notes on and sometimes photographs of objects that are either striking in themselves or whose chemical composition has been investigated, even when, so far as we can determine, they have no western context. It is indeed surprising how little advantage has been taken in archaeology of the use of spectrographic analysis, which can be performed so rapidly compared with gravimetric analysis by the standard chemical methods. It is on this account that we show in the tables at the end of our paper the results of the spectrographic analysis of a fairly large number of objects, and that we give here in Dr. Ritchie's own words details of the precise methods he employed and also a comparison with the gravimetric analysis of a few specimens selected as of special interest.

»The analyses were carried out by means of a Hilger »Medium» Quartz Spectrograph (E 3). In all cases, the sample under examination was placed on the lower (positive) pole of the arc, the electrodes being of highly purified Acheson graphite . . . , and the arc being operated at 5 amps. and 200 volts D. C., with a gap of 5 mm. The spectrum of every sample was photographed (exposure 8—10 secs. on Ilford Rapid Process Panchromatic Plates, using the smallest diaphragm) in juxtaposition to a comparison spectrum of Hilger R. U. (»raies ultimes») powder, by which the composition of the unknown sample was established. The arc was operated at 5½ amps. in the case of the R. U. spectra.

Where the specimen to be analysed was not homogeneous — when, for example, it consisted of a bead with inlaid designs of various colours, or a piece of pottery coated on one side with a glaze — the various layers were carefully dissected apart under the microscope and analysed separately, taking all possible precautions to avoid contamination of one layer by another.

In this way, . . . samples were prepared for analysis: lines due to Na, Ca, Cu, Si, and Fe were observed in all the spectra, and to Mg in all but two. It must be pointed out, in this connection, that the Acheson graphite electrodes contained very minute traces of Na, Si, V, and Mg. Further, it is practically impossible to photograph the spectrum of any unenclosed arc without obtaining, very faintly, the »raies

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<sup>7)</sup> A. Lucas, »Glazed ware in Egypt, India, and Mesopotamia», *Journal of Egyptian Archaeology*, Vol. XXII, 1936, p. 150.

ultimes» of Na, Ca, and Mg, due to the presence of these elements in atmospheric dust. Hence, when lines are reported . . . as due only to *traces* of Na, Si, V, Mg, and Ca, it is not safe to conclude that these elements were actually present in the sample analysed. When, however, these elements are reported in *moderate amount*, their presence in the sample is regarded as established.

The following twenty-six elements were sought in each spectrum obtained: Li, Na, K; Ca, Ba, Sr; Pb, Sn, Ag; Cu, Zn, Cd, Mg; Al, Si, V, Ti; P, B; Fe, Cr, Mn, Ni, Co; As, Sb. It should be noted that no trace of Cd or Ni was found in any of the [first 52] samples.

»The results are presented on a very roughly quantitative, as well as an accurately qualitative basis. In the following tables, L indicates a *large amount* of the element (»raies ultimes» very strong, and many other arc lines present), M indicates a *moderate amount* of the element (»raies ultimes» distinct, and a few other arc lines present), T indicates a *trace* of the element (spectrum practically confined to faint »raie ultimes»), and O indicates that the element is absent, or present only in infinitesimal amount.

While accurate figures cannot, of course, be assigned to these results, it may be taken that L indicates quantities of the order of 30 %, M of the order of 10 %, and T of the order of 1 % or less.»

The interesting question naturally arises, how far do the figures proposed by Dr. Ritchie for T, M, and L, agree with the results of gravimetric analysis in those instances in which specimens have been examined by both methods? Circumstances have prevented Dr. Ritchie and ourselves paying as much attention to this subject as we should have wished; we had, for instance, hoped to compare the results of spectrographic analysis of a range of glasses of known quantitative composition. Nevertheless, to quote Dr. Ritchie, »Generally speaking, the two corresponded well . . . I have had a slight tendency to overestimate sodium (which gives a strong spectrum line in amazingly small quantities) and to underestimate aluminium and calcium». The actual examples for which we cite both gravimetric and spectrographic analyses do, however, indicate another discrepancy between gravimetric readings and the spectrographic results. In some instances potassium has not been recognized spectrographically in specimens in which the gravimetric analysis indicates its existence, so that it may be that the readings for this element are in general too low. So far as the present paper goes, this is of little interest to the archaeologist. Nevertheless, we include some examples, which indicate *inter alia* the range of variation for the different elements in the results of the two methods. It will be noted that in no instance is the amount of potassium recognized gravimetrically larger than about 1 per cent.

Our first example is part of a colourless opalescent glass cicada of Han date, specific gravity 3.75, for which we are indebted to the Museum of Far Eastern Antiquities, Stockholm, the analysis being conducted in the Mellor Laboratories. The figures from the gravimetric analysis of the dried sample, which weighed

5.27 grams, are given in the central column<sup>8)</sup> and the results of the spectrographic analysis in Dr. Ritchie's customary notation in the third.

Na <sub>2</sub> O.....	4.32 .....	M
K <sub>2</sub> O.....	1.02 .....	O
CaO.....	0.12 .....	T/M
BaO.....	12.58 .....	M
PbO.....	43.20 .....	L
Cu.....	— .....	T
MgO.....	0.34 .....	T
Fe <sub>2</sub> O <sub>3</sub> .....	0.16 .....	T
Al <sub>2</sub> O <sub>3</sub> .....	0.76 .....	T
SiO <sub>2</sub> .....	34.42 .....	L
TiO <sub>2</sub> .....	0.10 .....	O
	<u>97.02</u>	

Remembering that Dr. Ritchie himself noted a tendency to over-estimate sodium, the correspondence in the chief constituents — apart from potassium — is sufficiently close to permit us to agree that the spectrographic results are likely to be roughly accurate quantitatively within the limits suggested on page 6.

This general agreement is further exhibited if we tabulate the gravimetric and spectrographic results of some of the beads for which we have both forms of analysis. B. 2 035 and S. 569 are the strikingly similar beads represented on Plate I. Nos. 1. and 2 respectively, and are both of Mediterranean or Near Eastern origin; S. 19 (Pl. I, No. 10) is of Chinese manufacture.

	B. 2035 Constantinople		S. 569 China		S. 19 China
Na <sub>2</sub> O.....	18.5	M	17.7	M	} 4.4 { M O T/M
K <sub>2</sub> O.....	0.8	O	0.8	O	
CaO.....	7.2	T	6.8	T	
BaO.....	0	T	0	O	
PbO.....	0	T	0	O	29.5 M/L
Cu.....	trace	T	trace	T/M	trace T/M
Fe <sub>2</sub> O <sub>3</sub> {	3.9 { T T		3.7 { T T		} 9.5 { M T
Al <sub>2</sub> O <sub>3</sub> }					
SiO <sub>2</sub> .....	68.2	L	67.5	L	42.5 L
Co.....	Def. trace	T	trace	T	O

The merest glance at these analyses reveals an astonishing feature, the presence of barium in Chinese glass in such considerable quantities as to give BaO 4 %

<sup>8)</sup> This specimen was dried at 190 C. To the figures shown should be added loss on ignition, 1.16 %, chlorine (oxygen equivalent of 0.22 being subtracted) 0.86 %, and sulphur on ignited sample 0.48 %, giving a total of 99.52 %.

in a Chinese bead (S. 19), and 12.58 % in the glass cicada. Much of this paper is concerned with the presence of barium in Far Eastern glass and its archaeological and geographical significance; here it is only necessary to point out that, so far as we can discover, it does not occur in Western glass except in traces until about 1884, when it was purposely introduced as a constituent of some of the new glasses with high refractive index and low dispersion put on the market by Messrs Schott of Jena.

### THE TRANS-ASIAN TRADE ROUTE

We have so far confined ourselves to some general statements concerning our material and the chemical methods used in our investigations. The discussion of actual specimens may well be further postponed until we have given some slight account of the main trade route, which two thousand years ago stretched from Europe across Asia for some five thousand miles to reach the capitals of the Eastern Chou and Han dynasties. Although there is nothing original in what we shall write on this matter, we believe that a short description of this highway — the Silk Route — will enhance the interest of our paper. After this we shall give a description of our specimens, beginning with a number of objects of western origin recovered from sites in the Far East.

The various stages of the highway have been recently described by Mr. G. F. Hudson in his important work, *Europe and China*. We have drawn on his account, but have considered it convenient to divide the highway into three main sections — eastern, middle, and western — rather than to consider it in four sections depending on political factors, as he does.

The eastern section, which may be regarded as starting either at Ch'ang An (the Han capital) or at Lanchow in central Kansu, i. e. the extreme northwest of China, passes south of the westernmost extension of the Great Wall but north of the Nanshan range, westward across Sinkiang (Chinese Turkestan), skirting the Tarim Desert either north or south to reach Kashgar (Issedon Scythica), the gate of the Pamirs. Kashgar is some 1,500 miles from Lanchow, and Turfan, the region of Stein's great discoveries, lies roughly halfway between the two cities.

The middle section crosses the Pamirs to reach Merv (Antiochia Margiana) by alternate routes, *via* Samarkand (Marakanda) or Balkh (Bactra).

From Merv the western section runs west and south across northern Iran to Hecatompylos and Hamadan (Ecbatana) to Seleucia-Ctesiphon just below the modern Baghdad, crossing the Euphrates at Zeugma where there was a Roman legionary camp, and thence to Antioch, whence the goods were distributed through the Empire.

The opening of the route as a continuous highway was in great part due to Chang Ch'ien, sent by the Emperor Wu (141—87 B. C.) to seek a mode of outflanking



the barbarians of the North, the Hsiung Nu nomads, identified with the Huns who attacked Europe a few centuries later. It seems worth emphasizing that it was sheer military necessity, not love of conquest or of gain, that first dictated Chinese exploration of the West. Moreover, in spite of the importance of the land route across Asia — of special interest on account of the discoveries by Stein and others that have been made along its course — it must be remembered that the use of the monsoons from the first century A. D. as a means of direct passage from the Red Sea to India was of even greater economic importance. Rome's trade with India was always greater than with the Far East; it is significant that no hoards of Roman coins have been found in China as they have in India.

### EXPORTS FROM THE MEDITERRANEAN AND NEAR EAST

We shall deal first with the objects exported from the Mediterranean and Near Eastern lands under two headings:

- (1) Beads and other small glass or glazed objects.
- (2) Glass vessels.

With regard to beads there is a considerable volume of evidence, some carrying the export as far back as several hundred years B. C. Nor in the case of beads are we confined to China — we can adduce instances from Indonesia, valuable not only for their intrinsic interest but also as evidence of the wide area of distribution of Mediterranean and Near Eastern glass.

The first instance we shall consider is the presence in China among beads discovered at Old Lo Yang of a number of specimens of a type common in the Mediterranean area during the earlier part of the latter half of the first millennium B. C. The body of these beads is of pale green-blue glass of translucent quality, with inlaid »eyes«, each with a deep blue centre surrounded by concentric white, brown, and white rings (Plate IV, Nos. 3 and 4). These beads from Lo Yang, a number of which were exhibited by Bishop White at the Courtauld Institute in 1934, so closely resembled specimens collected in Egypt (Plate IV, Nos. 1 and 2) that even without chemical examination there could be little doubt that they were identical with the Egyptian beads, and were in fact Egyptian beads that had reached China. The matter was put beyond doubt as the result of spectrographic analysis by Dr. Ritchie, who reported that one of the Lo Yang specimens and a specimen collected by Mr. Guy Brunton at Qau in Egypt were »qualitatively and quantitatively practically identical in composition«. How close the resemblance is will be obvious on examining the spectrogram, and by the table given below showing the elements present in these two beads. The spectrograms (folding inset) are so arranged that between each of the spectra of the same coloured glass from Qau and Lo Yang there is shown a spectrum derived from a standardized mixture of elements, fifty in number. This spectrum is in every case

marked R. U. The chief spectral lines corresponding to the elements entering into the constitution of the glass of these beads are indicated by arrows. The substantial identity of the Qau and Lo Yang glass for each colour is immediately obvious. The trace of cobalt shown in the spectra of the two blue glasses (of which it is the colouring agent) but absent in the white and green glass gives some idea of the delicacy of the method.

Spectrographic analysis of two glass eye-beads, found in China and Egypt respectively, each consisting of four coloured glasses: green, white, brown, and blue.<sup>9)</sup>

Component Elements	Green Glass		White Glass		Blue Glass	
	Chinese Lo Yang	Egyptian Qau	Chinese Lo Yang	Egyptian Qau	Chinese Lo Yang	Egyptian Qau
Sodium.....	M	M	M	M	M	M
Potassium...	T	T	O	O	O	O
Lithium.....	T	T	T	T	T	T
Calcium.....	M	M	M	M	M	M
Barium.....	O	O	O	T?	O	O
Tin.....	O	O	O	O	O	T?
Copper.....	T	T	T	T	M	M
Magnesium..	T	T	T	T	M	M
Iron.....	T	T	T	T	T	T
Manganese...	O	O	T	O	T	M
Chromium...	T	T	T?	O	T	T?
Aluminium..	O	O	T	T	T	T
Silicon.....	M	M	M	M	M	M
Boron.....	O	O	T	T	T	T
Antimony...	T	T	T	T	T	T
Nickel.....	O	O	O	O	T	T
Cobalt.....	O	O	O	O	T	T

Other examples can be cited of similar beads collected in the Near and the Far East, the members of each couple being so nearly identical with each other in chemical composition as to leave no doubt that both beads were made in the same locality.

The first instance is of a couple of beads, of which one member, collected in Rhodes (destroyed in analysis), may date to the seventh century B. C. and the other, from China (S. 124), is reputed to be of Han age (206 B. C. — A. D. 220). This latter specimen is covered with iridescence, such as is common on glazed objects of Han date, and like the common green Han glaze, it contains much lead.<sup>10)</sup>

<sup>9)</sup> In the above table T stands for a small amount of the element concerned, approximately from less than 1 % up to 5 %. M implies a moderate amount, from about 5 % to about 30 %, or more in the case of silicon; O signifies that the element concerned is absent. These examinations were carried out by Dr. Ritchie at an earlier date than those of the general mass of the material he worked with, and it will be noted that in this table the significance of M and T differs from that attached to these letters (page 6) in the tables of analyses at the end of the paper. This discrepancy does not affect the purpose of our table, which is designed to show the practical identity in the composition of the two specimens.

<sup>10)</sup> For a spectrographic analysis of green Han glaze see C. G. Seligman, 'Early Pottery from Southern China', in *Transactions of the Oriental Ceramic Society*, 1935, p. 9. Laufer, *The Beginnings of Porcelain in China*, Chicago, 1917, p. 93, gives a gravimetric analysis with 65.45 % of lead oxide (PbO).

Both specimens are of remarkably high specific gravity, that from Rhodes having a sp. gr. of 5.19 while the sp. gr. of the Chinese bead is 4.7. The chemical composition of these two beads is as follows:

	China	Rhodes
SiO <sub>2</sub> .....	30.9	29.0
PbO.....	65.1	69.6
CaO.....	trace	trace
Fe <sub>2</sub> O <sub>3</sub> } .....	0.7	trace
Al <sub>2</sub> O <sub>3</sub> } .....		
K <sub>2</sub> O } .....	0.7	1.0
Na <sub>2</sub> O } .....		
CuO.....	trace	trace
	97.4	99.6

From the glass-maker's point of view, the small amount of alkali is compensated by the large amount of lead.

Another couple of special interest, because Mr. Cooke has provided a gravimetric analysis, is presented by two beads, from Constantinople (Pl. I, No. 1), sp. gr. 2.42 and China (Pl. I, No. 2), sp. gr. 2.23. A similar bead from Florence (Pl. I, No. 3) not analysed, has a sp. gr. of 2.24. Although difficult to date accurately, beads of the type of the Constantinople and Florence specimens occur in the Eastern Mediterranean from the first half of the first millenium B. C. and are common in the second half of that millenium, being found in England from about the third century B. C. Gravimetric analyses of the Constantinople and China beads have been given on p. 7. Cobalt is present in both beads, as is copper, but only as a trace in the Constantinople bead.

We may next consider three small lions *couchant* of blue glass, each on a rectangular pierced base. These specimens are represented on Pl. IV, No. 6. All are practically the same size and of identical design, although they were collected respectively in Egypt, Teheran, and China. The Chinese specimen, now in the Royal Ontario Museum of Archaeology, was obtained by Bishop White from the district of old Lo Yang (the capital in late Chou times), but not, he thinks, from the Royal Tombs. As to date, the objects appearing at the time that the lion was collected were, in his opinion, to be dated between the third century B. C. and the first century A. D. On being shown these lions, Mr. Sydney Smith of the British Museum immediately recognized that they are in Near Eastern Asiatic style, and he especially called attention to the manner by which the ribs are indicated; this is essentially Asiatic, and occurs as early as the Sumerian period. It is, for instance, present in the copper bulls brought back by Sir Leonard Woolley, and in some of the early specimens collected by the late H. R. Hall. Mr. Smith regarded our specimens as of the fifth or fourth century B. C., not later. They

were made either in western Asia, e. g. in Persia, or in Egypt under the Persian dynasty, for it was by no means rare for objects of non-Egyptian style to be made in Egypt during the Persian period (525—332 B. C.).<sup>11)</sup> The biconical bead shown in Plate IV No. 5, collected in China by Bishop White, is composed of blue glass or glass-like frit of similar appearance to the lion from China. A number of these beads, which are certainly Near Eastern in origin (they may for practical purposes be called Egyptian, since so many occur in Egypt), have been found at Lo Yang. The spectrographic analysis (Table I) of the example figured shows that it consists mainly of silica, with calcium, a small quantity of soda, and enough copper to colour the glass; lead is absent.

Coming to later times, i. e. the early centuries of our era, the exploration by Sir Aurel Stein of Eastern Turkestan has provided ample evidence of the export of western beads to the Far East. The excavations conducted at Lou-lan and Niya, two sites in the Taklamakan desert, are of special interest. Niya was abandoned at the close of the third century,<sup>12)</sup> while Lou-lan was deserted »some-time during the fourth century A. D. and probably not long after its first third».<sup>13)</sup> From Niya comes a pendant in »blue paste» of Roman-Egyptian type,<sup>14)</sup> and other similar objects, e. g. half of a ribbed melon bead in »porcellaneous frit»<sup>15)</sup> — faience — with turquoise blue glaze, recalling innumerable Roman-Egyptian beads, and gilt glass beads<sup>16)</sup> certainly characteristic of Coptic Egypt (including Nubia).

One of the beads in a string of twenty-five from Lou-lan<sup>17)</sup> is a black bead with white combings; a somewhat similar bead with applied red, yellow, and white lines<sup>18)</sup> comes from Chong-tim, a site later in date but certainly not later than T'ang. These beads closely resemble a number of similar Roman-Egyptian beads in our own possession, as does another bead from Yotkan, a site from which the objects cannot be accurately dated.<sup>19)</sup>

Another bead is of the well-known western *millefiori* type<sup>20)</sup> (this, being from Lou-lan, is not later than the fourth century A. D.), while other, undateable,

<sup>11)</sup> Two examples to which Mr. Smith especially directed our attention are published by G. Steindorff and reproduced on pages 308 and 310 of his work, *Die Kunst der Ägypter* (Leipzig, 1927). The illustration on p. 308 shows the head of a wild goat in bronze, 32 cm. high (Berlin Museum), of decidedly un-Egyptian appearance; p. 310 reproduces a recumbent lion in bronze, 64 cm. in length, which is put at a rather earlier date, 588—569 B. C., on account of the royal name of Apries (Hophra) upon it.

<sup>12)</sup> *Serindia*, Vol. 1 p. 242.

<sup>13)</sup> *Op. cit.*, p. 426.

<sup>14)</sup> *Op. cit.* Pl. XXIX (N. 005).

<sup>15)</sup> *Ancient Khotan*, Pl. LXXIV (N. 005. b).

<sup>16)</sup> *Op. cit.*, Pl. LXXIV (N. 0020. a); *Serindia*, Pl. XXIX (L. A. 00171); *Innermost Asia*, Pl. XXIII (C. XCIII. 033 and 034), also Pl. XXIV (L. K. 097).

<sup>17)</sup> *Serindia*, Pl. XXIX (L. A. 00132).

<sup>18)</sup> *Op. cit.*, Pl. IV (Chong-tim, 0030).

<sup>19)</sup> *Ibid.* (Yo. 00114).

<sup>20)</sup> *Op. cit.*, Pl. XXIX (L. B. iii, 007c).

*millefiori* beads also occur from Khotan sites<sup>21)</sup> and from Kelpin,<sup>22)</sup> an oasis lying north on the edge of the T'ien-shan. In this connection we may refer to a *millefiori* bead of typical Roman manufacture from a grave in Java reproduced on Plate IV, No. 10; we shall return to this specimen later (p. 15), but meanwhile note that Dr. van Stein Callenfels informs us that the burial from which this came cannot be of later date than A. D. 200.

From these sites Stein also collected a number of fragments of glass vessels, which, since glass vessels of Chinese origin of early date are excessively rare, may be presumed to be of western origin. Fragments of blue and white glass, as well as gilt beads from Lou-lan now in the Museum of Far Eastern Antiquities, Stockholm, are illustrated on Plate IV, Nos. 7, 8, and 9. They are western in appearance, and their spectrographic analysis carries no suggestion that they are other than western. Both the blue and the white fragments are of low specific gravity, and are essentially sodium-calcium silicates; neither contains either barium or lead, though both contain a trace of strontium. The colour of the blue glass is due to copper, no trace of cobalt being discovered. While this result cannot be said *per se* to be conclusive of a western origin, it does, within our frame of reference, accord well with our conclusion.

We are indebted to Bishop White for the photographs and coloured drawings of two western glass bottles in the Royal Ontario Museum of Archaeology, which Mr. Hobson considers to date from the fifth to eighth century A. D. and to be of Near Eastern, i. e. Syrian or Egyptian, make. They are thus slightly earlier than Samarra<sup>23)</sup> and would be of about the same age as the specimens of western glass preserved in Japan in the Shōsō-in at Nara. One of the Toronto specimens, No. N. B. 4101 of the Royal Ontario Museum, reproduced as No. I of Plate III, is described by Bishop White as of light green glass with a scaling iridescent surface; it is very light in weight, and is about 11 cm. in height. Bishop White recognized that although it came from old Lo Yang it was not of the date of the Royal Tombs. Another vessel of similar glass and surface (N. B. 4102) has the shape of an elongated gourd with an expanded mouth, and is about 23 cm. high. Of about the same age are the examples of »Arab» glass in the Shōsō-in. Five of these specimens, figured in the first five plates of the seventh volume of the edition of the Shōsō-in Catalogue at present in course of issue, may be con-

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<sup>21)</sup> *Op. cit.*, Pl. IV (Khot. 0072).

<sup>22)</sup> *Op. cit.*, Pl. VI (Kelpin, 009 a). On Pl. IV, no. 12, we reproduce a bead of similar construction, though of rather different appearance, from Lou-lan, now in the Stockholm Museum of Far Eastern Antiquities (K. 11227:60). Its appearance suggests a date of about the beginning of our era.

<sup>23)</sup> The spectrographic analysis of two specimens of Samarra glass is given in Table I. It will be seen that these are essentially sodium-calcium silicates, with a trace of magnesium and with or without a trace of lead, while the gravimetric analyses of 5 pieces of Samarra glass by Neumann, published by C. J. Lamm (»Das Glas von Samarra«, being Vol. IV of *Die Ausgrabungen von Samarra*, Berlin, 1928, p. 129), indicate that his specimens were sodium-calcium-magnesium silicates, of which three contain small quantities — up to 1 % — of lead.

sidered on the authority of Messrs W. A. H. King and R. Hinks of the British Museum to date c. 700 A. D. and to have been made in Mesopotamia, Persia, or possibly Alexandria. Naturally it has been impossible to have any form of chemical examination made of these historic specimens, but Bishop White has most courteously put at our disposal scrapings from the two fifth to eighth century vessels of western glass to which we have referred above. The spectrographic examination of these carried out by Dr. Ritchie indicates their close resemblance to Lou-lan fragments, for they also are essentially sodium-calcium silicates, lead and barium being absent (Table I).

We may sum up the last few pages by stating that they indicate beyond doubt that there was a considerable export to the Far East of glass ware and beads from the Roman Orient during the few centuries before and after the beginning of our era.

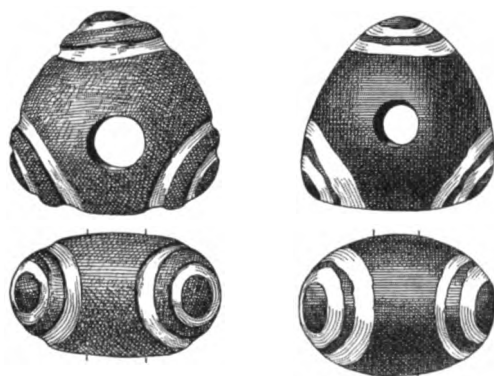


Fig. 1. Glass eye-beads, black and buff, from Johore (left) and Cumae (right, Table I).

It is not the purpose of this paper to discuss the evidence for early contact between the Roman Orient and India — that has been so well done by others as to be unnecessary<sup>24)</sup> — but the Indonesian data indicating contact during or before the early centuries of our era are less well known. We may first refer to a type of large black glass bead, flattened, more or less triangular, with a somewhat rounded outline bearing an eye at each corner. Such beads have been found on a number of sites in the Mediterranean area. Examples from the sixth or seventh century B. C. are in the British Museum, while in the Beck collection are strings of these beads from Cumae and Pozzuoli of about the same date. The examples we figure (fig. 1) are from Cumae and Johore. Not only are they identical in appearance, but there is little difference in specific gravity, 2.67 and 2.27 respectively.

<sup>24)</sup> H. G. Rawlinson, *Intercourse between India and the Western World*, Cambridge, 1916; E. H. Warming, *The Commerce between the Roman Empire and India*, Cambridge, 1928. We may, however, add one new fact for which we are indebted to Sir John Marshall, who discovered at Taxila several eye-beads which he dates to the fifth to third centuries B. C. These can scarcely be of other than Mediterranean origin. Of 7 specimens examined, 6 have a sp. gr. of 2.35—2.40 and 1 of 2.45—2.50.



Since the bead of typical »Roman» *millefiori* type (Pl. IV, No. 10) from a dolmen in Java, to which we have referred on page 13, is of about the second century A. D. and has been examined spectrographically (Table I), it seems worth describing in some detail. Its length is 16.5 mm., its diameter rather greater, its sp. gr. 2.54. Its body, of blue glass so dark as to appear black, is traversed longitudinally by sections of white canes with darker centres. Although there can be no doubt that the bead is of western make — it belongs to a common »Roman» type — it is of a class well known in the East Indies. A closely similar but larger bead, in the possession of Captain Brooke, comes from Sarawak (this is reproduced from a water colour drawing as No. 13 of Plate II), while two other very similar specimens were found in a stone cist grave in the district of Jokjakarta in Central Java.<sup>25)</sup>

To these examples we may add some of the ancient and locally extremely valuable beads worn by the up-country natives of Borneo. A series of such beads are reproduced in colour by Hose and McDougall on Plate 130 of their well-known work *The Pagan Tribes of Borneo*. Beads 1, F, and H, of this plate are of Romano-Egyptian type, while A, a bead decorated with rosettes (in such a manner as to resemble a flower), represents a type that has been found in Egypt, where it is of considerable antiquity. The specimen we figure (Plate III, No. 6) was found by Mr. Brunton when excavating a large cemetery containing burials of the period XXII to XXV dynasty, roughly between 900 and 600 B. C., but the type persists very much later and seems to have been exported to the Far East in some quantity. Cane chevron beads such as are commonly found in the Near East, where they appear to have been made at least as early as the Dark Ages, are also not uncommon in Borneo, as well as imitations of these in which the chevron effect is obtained by applying canes of white and red glass to the bluish surface of the bead.<sup>26)</sup>

### CHINESE GLASS

The generally received statement regarding the first glass to be made in China is that given in the *Annals* of the Wei Dynasty, A. D. 386—557. This, the classical account of the event, states that the art of making glass was introduced into China in the fifth century A. D. by travellers from the West. But a passage quoted by Mr. Arthur Waley<sup>27)</sup> indicates that glass was being made in southern China a

<sup>25)</sup> A. N. J. à Th. Van der Hoop, »Steenkistgraven in Goenoeng Kidoel» *Tijdschrift voor Indische Taal-Land-en Volkenkunde* LXXV (Batavia), 1935, pp. 83—100. One of these beads is figured (Fig. 15, No. 21), as well as other contents of the tomb, including a long hexagonal carnelian bead and a number of small glass beads consisting, as it appears, of glass canes fused together. It does not seem possible to date this grave; the skeletons it contained appear to derive from bodies thrust in over a period of years, but its contents included many iron tools.

<sup>26)</sup> Beads of this type are figured both by Hose and McDougall (*Op. cit.*), and by H. C. Beck, »Notes on Sundry Asiatic Beads», *Man*, 1930, 134. This latter paper also figures a bead of the same type as Hose and McDougall »A» i. e. of the type from Egypt which we figure on Pl. III, No. 6.

<sup>27)</sup> »Notes on Chinese Alchemy», *Bulletin of the School of Oriental Studies*, Vol. VI, 1930—32, p. 13.

century earlier. The passage occurs in relation to Pao P'u Tzu's attitude to alchemy. It is stated that glass, which at first had been supposed to be a kind of crystal, was then actually being made in southern China: »The crystal bowls from abroad are really made by compounding five sorts of ashes; and today this method is being commonly practised in Chiao and Kuang (i. e. parts of the modern provinces of Kuantung, Kuangsi, and the neighbouring portion of Annam).» Now, Pao P'u Tzu is a pseudonym for Ko Hung, who lived c. 260—340 A. D., so that if we assume that the above passage was written c. 300 we have literary evidence that glass was being made in southern China at least one hundred years before its alleged introduction into northern China by westerners. It was actually being made centuries before this, and since by far the greater part of the remaining portion of this paper will be devoted to describing and discussing specimens of glass, mostly beads, that we believe to be of Han or pre-Han date, it will be well to give in some detail the arguments that lead us to assign this relatively early date to so large a number of specimens.

Our dating is to a considerable degree based on the specimens figured in Bishop White's book, *The Tombs of Old Lo-yang*, on a number of specimens exhibited in 1934 at the Courtauld Institute, and on a series of photographs of objects in the Royal Ontario Museum of Archaeology, Toronto, for which we are indebted to Professor C. T. Currelly and to Bishop White. The main difficulty to be faced is that in every case dating is indirect or circumstantial; in no instances have the objects we describe been scientifically excavated; in a few examples where glass and metal are associated in a single object there is the criterion of style. Nevertheless, we believe that as regards specimens that we claim to belong to a period that we term »pre-Han or Han» (admitting our uncertainty whether objects of this group are Han or earlier), we are not likely to be far out in our attribution. The same probably holds true of the objects we have called T'ang, and concerning two of the specimens of this group there can be no doubt, since they are lumps of glaze taken from pottery or stoneware vessels of unmistakable T'ang date.

In our opinion the most important evidence is that to be deduced from the contents of Bishop White's volume, *Tombs of Old Lo-yang*, in which the author informs us that »since 1929» a series of »very beautiful things have been coming to light from a district near Lo-yang». <sup>28)</sup> Among these objects, as indicated in his volume, was a large number of exquisitely ornamented beads, in our classification (p. 19) attributed to Class A (Group 2). It is important to note that these beads did not appear in any quantity among the antiquity dealers in China until a few years ago, and this also applies to the beads of Class B, and in the main to capstan beads. The plundering of the tombs of old Lo Yang was undertaken on an extensive scale just about that time, so that there is an *a priori* probability that the beads of this type come from Lo Yang or from graves in its neighbourhood. If, then, the age of the finds catalogued as coming from the Lo Yang tombs can be

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<sup>28)</sup> *Tombs of Old Lo-yang*, p. I.

shown to belong in vast preponderance to any particular date, the glass in which we are specially interested must also for the most part be of this date.

If we examine the figures of objects reproduced in *Tombs of Old Lo-yang*, and described in the body of the volume, we find that with the exception of the objects represented on Plate LX, i. e. two specimens, there are no pieces that on archaeological grounds we are compelled to describe as substantially later than Han, while many are certainly pre-Han. That is to say, with the possible exceptions noted above, we discover nothing in this Lo Yang group of objects that need be attributed to Wei or T'ang times.<sup>29)</sup>

This negative evidence seems to us of considerable importance, but there is definite positive evidence to which many will attach more weight. Looking through the group of objects figured in *Tombs of Old Lo-yang*, we find Plates I, II and III devoted to views of a bronze animal head inlaid with gold and silver, the specimen now in the British Museum, where it is ascribed to late Chou. Neither of the bronze finials inlaid with gold and silver in the British Museum is the finial represented on Pl. XXIV; the general design is similar, but details of the inlay are different. There can, however, be no doubt that all three specimens are of the same date as those in the British Museum, again attributed to late Chou. The bronze inlaid pieces on Pls. IV to IX obviously belong to the Han or pre-Han group. Had they been exhibited at the Chinese Exhibition at Burlington House they would have been catalogued as pre-Han. The mirrors illustrated on Pls. XLVI to LII are Han, or, in the majority of instances, late Chou. The object illustrated on Pl. LIII belongs to this »pre-Han or Han» group, as do those on Pl. LV to LIX, with the possible exception of object No. 141 (similar to our robe-hook No. 2, Pl. VIII), these robe-hooks being regarded by Mr. Hobson as of Han date.

There seems no reason to attribute any of the metal objects represented on Plates LXII to LXXV to any other date than »pre-Han or Han». This holds equally of the objects shown on Plates LXXVI to LXXXIV, indeed the large bronze horse on the last plate closely resembles a specimen in the British Museum, where it is attributed to the late Chou period. Plates LXXXVIII to CXIV are all »pre-Han or Han», except where the objects represented can definitely be referred to the late Chou period.

So much for the bronzes. The jades, Plates CXIX to CXL, tell the same tale, all are Han or pre-Han according to our current archaeology; occasionally an outstanding specimen has been publicly exhibited, as for instance the specimen on Plate CXXXI, which in the Chinese Exhibition (No. 341) was assigned to the period of the Warring States (i. e. late Chou). It must thus be admitted that practically one hundred per cent of the objects illustrated — bronze and jade — are of pre-Han or Han date.

Coming to the glass objects that from the standpoint of our paper are of critical value, let us begin with those that are most definite. The two glass *pi* figured on Pl. CLXVI are of the same type as many made of jade, universally attributed to Han times. Moreover, such glass *pi* occur in a number of collections, where they are labelled Han and generally accepted as of that date. Glass capstan beads such as those figured on Pl. CLXV (451 c, d, e, f, g, h) have been found *in situ* in graves of Han date at Lo-lang in Korea; we may thus attribute them to the Han period, un-

<sup>29)</sup> But see footnote, p. 19.

less there is any special reason for considering a particular example to be of later date. Engraved glass plaques resembling that on Pl. CLXI (423) exist in large numbers in the British Museum, where they are given a Han date. A specimen in every way resembling the glass eye-plaques (Pl. CLXV 450) and like them mounted in silver, exists in the Museum of Far Eastern Antiquities at Stockholm, where it is considered at least as old as the Han period. Our own similar specimen — Figure 7 — is shown by spectrography to contain a considerable quantity of barium, which so far as our experience extends does not occur in glass believed to be later than of Han date.

Here then is fairly conclusive evidence that much of the glass from old Lo Yang belongs to our »pre-Han or Han» group. Let us now turn to the glass and composite »eye-beads». Unfortunately the greater number of these beautiful objects have not reproduced well in the plates of *Tombs of Old Lo-yang*. Nevertheless, it is possible to determine that a number of the illustrations of these beads represent specimens of the same type as some of those in our own possession reproduced in this paper<sup>30</sup>). As already stated, we had the advantage of handling similar beads exhibited by Bishop White at the Courtauld Institute in 1934 and also of studying many carefully taken photographs of beads of these types in the Royal Ontario Museum of Archaeology. As we shall see later, the chemical composition of these beads does point to their being of pre-T'ang and also probably of pre-Wei date, but we do not at present desire to bring forward arguments based on chemical composition. Rather let us consider the very large number of eye-beads of the types reproduced by Bishop White which have come on the market within the last few years, i. e. since the finds at Lo Yang. Such beads were scarce until recently. On the other hand, figures obtained from T'ang and Wei tombs have been imported in very considerable numbers for at least a quarter of a century, indicating that the sources from which the beads and the Wei and T'ang figures were derived were not the same. With regard to the beads, it would, we believe, have been difficult to make a collection until the last five years or so. This period or a little longer does not coincide with the plundering of T'ang tombs but corresponds with the exploitation of Lo Yang, which, as we have seen, has yielded pieces of glass (*pi*), capstan beads, and metal-mounted plaques of the »pre-Han or Han» group. Considering all these facts, it seems to us that to doubt the pre-Han or Han date of the vast majority of specimens, including glass, figured by Bishop White from old Lo Yang is to practise an undue scepticism and to raise quite unnecessary doubts as to the broad dating of these objects. The discovery on this site

<sup>30</sup>) For instance, the bead represented on Pl. CLXIII: 431 of *Tombs of Old Lo-yang* is precisely the same type as our No. S. 112, Pl. I: 12; Pl. CLXIII: 432 closely resembles the bead in the Toronto Museum reproduced here as Pl. III: 4, and this latter bead is perhaps shown in Group 446 on Pl. CLXIV of *Tombs of Old Lo-Yang*. On this plate the left hand bead in Group 444 is obviously similar to our No. S. 347, Pl. V: 6, while Group 448, described as beads with earthenware cores, are of the same type as our No. S. 55, Pl. II: 5. The Egyptian bead (S. 37) from Lo Yang represented on our Pl. IV: 5 is one of the series shown on Pl. CLXIII: 442; on the same plate, No. 434 resembles our No. S. 321, Pl. I: 11.

of »Mediterranean» beads of the latter half of the first millenium B. C. only confirms our opinion.<sup>31)</sup>

Having expressed a belief based on general considerations as to the age of the glass specimens that we propose to describe (we shall show later that this opinion is supported by chemical evidence), we set forth the following table as indicating the grouping we propose to adopt for descriptive purposes for the glass beads, miscellaneous small glass objects, and glazed beads, which we have every reason to believe were made in China.

#### CLASS A.

Objects of glass throughout, apart from applied ornament.

*Group 1.* Monochrome glass beads or small objects (frequently of very high specific gravity) without applied ornament. This does not preclude beads having a decorative shape, or other objects having cast or incised ornament.

*Group 2.* Glass beads and plaques (frequently of high specific gravity) with applied ornament as »eye» patterns, or in a few instances loop patterns or circles.

#### CLASS B.

Composite beads with siliceous central core of quartz or glass faience. The surface may carry an elaborate polychrome decoration, often knobbed.

Certain rare glazed vessels and objects whose ornamentation has an obvious affinity to the glass beads and plaques belonging to the above groups will be described and discussed separately (pp. 39—40).

We may now consider the style, including ornament, and the physical and chemical characters of the objects belonging to each group. In doing this a certain amount of repetition seems inevitable; an attempt will be made to reduce this to a minimum. This can to a certain extent be achieved by discussing here, without regard to its logical position, the occurrence and significance of the element barium in Chinese glass. We have already alluded (pp. 7—8) to its presence and hinted at its importance. Further, we have already published two short statements, the first recording the existence of the element in Chinese glass, the second indicating that its occurrence is limited to glass that we believe to be of Han or pre-Han date.<sup>32)</sup> We would now qualify the latter statement by adding the words »except in traces», but would at the same time state that we do not attach particular im-

<sup>31)</sup> Bishop White has kindly answered a number of questions concerning his attribution to Lo-yang of the objects he describes and figures in his book. He gives the following list of specimens concerning which he now feels that provenance is doubtful: Nos. 145 a., b., c.; 147; 256; 360 a., b., c., d., e.; 415; 416; 436, a. b.; in all thirteen specimens. We may draw attention to the fact that no glass or jade cicadas or pieces of sword-furniture are figured in *Tombs of Old Lo-Yang*, and that Bishop White informs us that so far as he could discover none were found.

<sup>32)</sup> H. C. Beck and C. G. Seligman, »Barium in Ancient Glass», *Nature*, Vol. 133, 1934, p. 982; C. G. Seligman, P. D. Ritchie, H. C. Beck, »Early Chinese Glass from Pre-Han to T'ang Times», *op. cit.*, Vol. 138, 1936, p. 721.

portance to this qualification, since barium is a common and widely distributed element in China, associated with lead ores.

We are indebted to Professor C. Gilbert Cullis for much interesting information concerning the presence of barium in the Far East. There has been a steady production of barium minerals of late years in Korea, attaining more than 6 000 long tons in 1932. The barium minerals — principally the sulphate, barytes, and the carbonate, witherite — usually occur as accessory constituents in lead-zinc deposits and are obtained as by-products in course of recovery of the lead and zinc from their ore-minerals. Occasionally a vein may consist in the main of one or other — namely, barytes or witherite — or even of both these minerals, and then a »straight» barium mine may be established, but this is somewhat uncommon. Professor Cullis knows of no record of such »straight» barium deposits in China, but there are lead-zinc deposits and mines in plenty, and he would suppose that it was from such sources that the barium minerals used in making glass were obtained. It will be seen that this suggestion accords well with the frequent presence of both barium and lead in Han and pre-Han glass. Lead-zinc mines are known to occur in Manchuria, Hupeh, Szechuan, Hunan, Kweichow, Yünnan, Kwangsi, and Kwantung. The most important is said to be that at Shui-kou-shan in Hunan, which has been worked at intervals for at least 300 years. Other mines are reported to have been in operation soon after the beginning of the Christian era, and in 1078 the total output of lead was over 5,000 tons.<sup>33)</sup>

Even a cursory examination of the tables of analyses derived from the reading of spectrograms taken for us by Dr. Ritchie will show the frequency of the presence of barium in the beads that we allot to the period »pre-Han or Han». Besides these, we have two quantitative analyses of beads of this group, kindly made for us by Mr. Cooke, to whom we are indebted for all except one of the quantitative results recorded in this paper.

The first analysis refers to the bead with a specific gravity of 3.57, reproduced as No. 13 of Plate I, and is of the dark blue glass constituting its body:

#### Analysis

SiO <sub>2</sub> .....	41.9 per cent
PbO.....	24.5 » »
BaO.....	19.2 » »
CaO.....	4.5 » »
Fe <sub>2</sub> O <sub>3</sub> }	4.4 » »
Al <sub>2</sub> O <sub>3</sub> }	
Alkalis.....	4.5 approx.
CuO.....	trace
	<hr/> 99.0

<sup>33)</sup> W. F. Collins, *Mineral Enterprise in China*, 1918, p. 18.



The other specimen is a capstan bead (destroyed in analysis) of a light blue colour, similar to but smaller than those figured on Plate IV.

SiO <sub>2</sub> .....	50.0	per cent	
PbO.....	25.0	»	»
Mixed alkalis, expressed as K <sub>2</sub> O	12.0	»	»
BaO }			
CaO }	10.0	»	»
		(of this an appreciable amount is barium oxide)	
Fe <sub>2</sub> O <sub>3</sub> }			
Al <sub>2</sub> O <sub>3</sub> }	1.0	»	»
	<hr/> 98.0		

Although as already stated these figures have been recorded elsewhere,<sup>34)</sup> we reproduce them here, since not only are they, so far as we can discover, the first analyses of ancient glass to show a high barium content, but they constituted the stimulus to the further investigations recorded in this paper.

We do not imagine that the high barium content of such Han and pre-Han glass was purposeful in the sense that its presence was purposeful in the Jena glass (p. 8), but, as we have seen, barium ores are widely distributed in China, and the early Chinese may have learnt by experiment that the use of material from particular localities gave specially desirable qualities to the glass produced. In the Ming period, for instance, certain cobalt ores brought from the West — and therefore called Muhammadan blue — were found to give the most admired shade of blue in Blue and White porcelain, the use of native cobalt ores persisting side by side with the Muhammadan blue for the more ordinary ware and replacing it when the supplies of the more desirable colouring matter ran short.

In spite of what we have written concerning the importance of the presence of barium in glass of the »Han and pre-Han» group, we must point out that it is absent from some specimens which on general archaeological grounds can be referred to this period, and a number of such specimens are cited in Table III. On the other hand, it will be seen that barium is present in a larger number of instances equally to be referred to this period. Moreover, it is present except in one instance, in the large glass beads and plaques with elaborately developed »eyes» which constitute the great majority of our group A. 2, as well as in the fragment of the vase with compound »eye» pattern illustrated in colour on Plate III. From these facts we may perhaps infer that this particular type of eye-bead was, in the main, made in a factory or group of factories at a time when these factories were using a barium ore as a constituent of their glass. Other factories, working at, in a broad sense, much the same time, did not use barium, and so far as our evidence goes scarcely produced this type of eye-bead, though they did

<sup>34)</sup> See footnote, p. 19.

produce excellent quality glass. Alternately, a single factory or group of factories may have given up producing barium glass in favour of a glass lacking this element, but we think this less likely, since »eye» plaques containing barium and plaques without eyes and containing no barium are found in precisely similar robe buckles of Han, or slightly later, date (*cf.* Plate VIII).

We therefore hold that the absence of barium in glass is of no archaeological significance, in that it does not allow any suggestion to be made as to the provenance of the specimen or its date. On the other hand, the presence of more than a trace of this element does, so far as our present knowledge extends, offer *prima facie* evidence that the glass in which it occurs was made in China, and further that it is of considerable age, which provisionally we state as »pre-Han or Han». We shall assume this as accepted in the remainder of this paper, and summarize our reasons for putting forward this view as follows:

(1) As stated on page 8, we have been unable to find records of the presence of barium (except in trace) in the archaeological literature to which we have had access.

(2) Of specimens examined spectrographically, barium in quantity greater than »trace» is present in 32 examples out of 43 to which a Han or pre-Han date is attributed on archaeological or stylistic grounds.<sup>35)</sup>

(3) Of 8 objects, including two lumps of glaze, attributed to the T'ang period and certainly stylistically post-Han, no specimen contained barium in larger quantity than a trace, while this was equally true of certain objects, ten in number, which Bishop White is inclined to attribute to the third to fifth centuries A. D.<sup>36)</sup>, though possibly this group contains specimens of later date. It is also absent except as a trace in a group of 7 objects (Table VII) judged to be of Sung date or later, including in this group 4 specimens of present day »Peking glass»<sup>37)</sup>

Before considering in detail the actual specimens that have passed through our hands, we may refer back to pages 5—6 where we give some account of the methods of chemical examination to which they have been submitted, and indicate the plan we have adopted in the tables of spectrographic results at the end of our paper. In these results the identification of any particular specimen is rendered easier by the headings in the tables, which are both geographical and chronological. Each specimen is described in the fewest possible words, after which there will often be found an initial and a number in parentheses followed in many instances by Roman and Arabic figures. The initial and number in parentheses refer to the collection in which the specimen exists and its number in

<sup>35)</sup> These figures are derived from the analyses shown on Tables III and IV, the results recorded for 2 *pi*, 2 cicadas, 1 object of unknown use (pp. 25—26), the capstan bead derivative and blue compound eye-bead referred to on pages 24 and 29 respectively.

<sup>36)</sup> For spectrographic analysis of these specimens see Table 111 (p. 216) of Dr. Ritchie's paper, »Spectrographic Studies on ancient Glass», alluded to on page 2.

<sup>37)</sup> Concerning »Peking glass», see p. 47.

that collection, while the Roman and Arabic numbers refer to the plates in this paper. The abbreviations used are:

- B. Beck Collection.
- B. M. British Museum.
- C. Cambridge Museum of Archaeology and Ethnology.
- C. P. The Collection of H. R. H. the Crown Prince of Sweden.
- Ö. S. Museum of Far Eastern Antiquities, Stockholm (Östasiatiska Samlingarna).
- S. Seligman Collection.
- T. Royal Ontario Museum of Archaeology, Toronto.
- V. and A. Victoria and Albert Museum, London.

The grouping of the specimens in the tables is as follows:

- I. Comparative material: Near Eastern and Miscellaneous, of all ages.
- II. Material from Central Asian trade routes.
- III. Chinese material, of Pre-Han or Han age, Class A, group 1.
- IV. Chinese material of Pre-Han or Han age, Class A, group 2.
- V. Composite beads, Pre-Han or Han, Class B.
- VI. Chinese material of T'ang date.
- VII. Modern Chinese material, including all post-T'ang specimens.

In order that our description and discussion may be clear, it seems necessary to define three terms that we shall frequently employ, viz., »eye», »eye-bead», and »compound eye».

By »eye» we mean a design in which a central coloured, rounded, oval, or somewhat lunate area is surrounded by one or more white or coloured rings. The rings, where more than one exists, are commonly roughly concentric and are usually of contrasting colours. An »eye-bead» is a bead bearing such eyes. Structurally, two forms of eyes are recognized, which we term »impressed» and »stratified». In the »impressed» eye the white or coloured glass, usually white, constituting the ring of the eye, is merely pressed into the body of the bead and does not pass under the central coloured area of the eye. In the »stratified» eye a depression is made by pressing into the body of the bead a drop of plastic glass, and again pressing into this plastic glass of another colour. When glass of the same colour as the body of the bead is used in the second operation, the centre of the eye will appear lighter than the mass of glass constituting the bead on account of the reflection from the layer (generally white) behind it. The eyes in the insets in belt-hook No. 3 of Plate VIII are good examples of stratified eyes. The layers of glass constituting a stratified eye may themselves be of more than one colour, as in No. 9 of Plate I, and layer upon layer may be heaped up to make raised, or knobbed, eyes projecting considerably above the body of the bead.

A »compound eye» consists of a group of eyes, enclosed within a more or less circular ring.

As instances of beads to which these terms would be applied, the »Mediterranean» beads, Nos. 1, 2, and 3 of Plate I, and Nos. 9 and 10 of Plate II are ty-

pical eye-beads, while beads 4, 5, and 6 of Plate I have compound eyes, as have Nos. 1, 2, 4, 5, and 8 of Plate V. The compound eye-beads are particularly pleasing aesthetically on account of the high quality of the glass of which they are composed, the beauty of their ornament, and their excellent finish. They are of high specific gravity. Of 8 compound eye-beads cited in Table IV (including the horned bead), all have a sp. gr. of 3.25 or over, the average sp. gr. being 3.53. Interesting and beautiful effects are also obtained by the use of a simple eye with eccentric instead of concentric circles, as in No. 10 of Plate V.

### OBJECTS OF CLASS A, GROUP 1.

We may now discuss in some detail the actual specimens we have examined, beginning with Class A, group 1, of which we repeat our definition, viz. glass beads or small objects (frequently of very high specific gravity) without applied ornament. This does not preclude beads having a decorative shape, or other objects with cast or incised ornament. We have only a few beads of this group, the majority capstan beads. The specific gravity and composition of those examined are given in Table III, and a gravimetric analysis of a capstan bead is given on page 21. The two beads belonging to this group, and one of the capstan beads, contain barium, but the capstan bead represented as No. 16 of Pl. IV contains no barium, its excessively high specific gravity (4.9) being due to lead. We have seen a considerable number of capstan beads; they seem to have been common and widely traded. Examples occur in graves of Han date at Lo-lang<sup>38)</sup> in northern Korea, while both Stein and Bergman figure examples from Lou-lan.<sup>39)</sup> A modification of the typical form occurs in which the bead (generally longer than the true capstan bead) has an expansion at only one end, the rest of the length of the bead being almost cylindrical. There are a number of such specimens in the collection of H. R. H. the Crown Prince of Sweden (Nos. 1313—1316), and a fragment from one of the two longest of these (C. P. 1314, length 4 cm.) has been examined spectrographically by Dr. Brewer. This specimen is a sodium-calcium-barium silicate, containing much barium and a considerable amount of strontium, with magnesium, aluminium, and traces of iron, copper, and tin, but no potassium. The archaeological interest of the objects of this Class (A, Group 1) is that, apart from beads, they are all ceremonial in nature and connected with mortuary rites. The *pi* and cicadas have definite traditional positions upon or within the body, the sword furniture appears to have been placed in more or less appropriate positions with regard to the body. With few exceptions all

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<sup>38)</sup> Y. Harada, *Lo-lang*, Tokyo, 1930, Plates 91, 118, 119.

<sup>39)</sup> Stein, *Serindia*, Pl. XXIX, L. A. 00139; F. Bergman, 'Lou-lan wood-carvings and small finds discovered by Sven Hedin', *Museum of Far Eastern Antiquities, Bulletin* 7, 1935, Pl. XIII.

these objects are uncoloured, of a greyish tone, while those represented are also known to exist in jade. Some, at least, must have been exclusively made for purposes of burial, for sword furniture of glass, even for the most ceremonial purposes, would have been useless to the living. We therefore suggest that once the manufacture of glass had become relatively easy it was soon recognized that its resemblance to jade permitted the living, if sufficiently well endowed, to do honour to their dead at less sacrifice than heretofore, while a probably numerous class who could not afford jade objects for their dead were now enabled to bury them with so colourable an imitation of the precious stone that the spirits, at least, would not know the difference. It may even be suggested that the discovery of the fact that glass afforded an excellent imitation of jade was a stimulus to the manufacture of the former. There can be no doubt of the necessity for inhumation with the corpse of such ritual objects as *pi*, since there exists in the Eumorfopoulos Collection a *pi* of roughly baked clay. The sword guard (Pl. XV, No. 3 b) and the piece of sword furniture shown on page 48, seem to us especially interesting from this point of view, though presumably it was only members of the official classes whose spiritual welfare required sword trappings to be buried with them.

We have assembled on Plate XV three couples of jade and glass objects identical in form and no doubt in purpose, the jade object in each instance being on the left. Above are two *pi*, below this two objects of unknown purpose, the jade example far more recent than the glass. The latter was exhibited at the Chinese Exhibition (No. 606) where it was regarded as of Han date. Of the two sword cross-pieces in the lowest register, the jade specimen is in the collection of Mr. Oscar Raphael.

On the chemical side, the composition of some of these surrogates for jade is particularly interesting as demonstrating the variety of glass made at this early date. The majority contain barium, and a few contain a trace — in one instance more than a trace — of strontium, which mineralogically is often associated with barium. With the single exception of a polychrome plaque (B. 2542), lead is present in medium to large amounts in all the specimens that contain barium in quantities greater than a trace. The small group of objects of this class that do not contain barium may or may not contain lead. The *pi* (S. 36) photographed on Plate XV and recorded spectrographically on Table III contains no barium and only a trace of lead, but fragments of two other *pi* (from the collection of H. R. H. the Crown Prince of Sweden) have been examined spectrographically by Dr. Brewer. One of these (C. P. 1433) contains silicon, barium, sodium, and lead as main constituents, while the other (C. P. 1034) contains silicon, aluminium, and lead as main constituents, with barium and magnesium as minor constituents, strontium being present as a trace and potassium absent. The composition of glass cicadas is equally noteworthy, though these objects are so well known that we have not thought it necessary to figure an example. The spectrographic analyses of two specimens — (Ö. S. K. 9614 and S. 33) are

given on Table III; both contain considerable quantities of barium. Two other examples, archaeologically of Han date, have been examined by Dr. Brewer. One of these, of greenish-blue glass, with a specific gravity of 4.0, is mentioned on p. 39. Its »main constituents» (to quote Dr. Brewer's report) are silicon, barium, iron, lead, sodium, with copper as a minor constituent and traces of tin, aluminium, magnesium, and calcium; potassium and strontium are absent. The other specimen (No. 1299 in the collection of H. R. H. the Crown Prince of Sweden) contains as main constituents silicon, barium, and lead, with strontium among the usual minor constituents and relatively very little sodium; potassium is absent. To these we may add an object of unknown use (C. P. 1298), which, to judge from a photograph, might be some form of roller; this contains silicon, lead, and considerable potassium as main constituents, traces of strontium and copper, and minute traces of barium.

Of later date is the group of objects represented on Plate XI, since these are of types commonly and probably correctly attributed to the T'ang dynasty. The specific gravity of these five specimens is low. The three specimens it was possible to test all have a sp. gr. below 2.6, while the two untested specimens do not feel heavy in the hand as does glass of a sp. gr. of 3.5 and over; they either do not contain lead or contain it in small amount. On the other hand, a lump of glaze from a small pot (the property of Mrs. Margot Holmes) covered with typical T'ang glaze was very heavy, with a specific gravity of about 5, and contained much lead. Moreover, a series of small oblate beads, black, green, and yellow, said to come from a T'ang grave, have an unusually high specific gravity and contain lead in quantity. It would thus seem that in T'ang times, as at earlier and later dates, both lead and leadless glass was being made. The spectrographic analysis of our T'ang specimens is given in Table VI; it will be noted that none of the objects examined contain barium, except as a trace.

Within Class A, group 1 we would place a group of objects of unusual appearance, whose purpose must remain conjectural, represented in the Toronto and Stockholm museums as well as in the Musée Guimet. These objects are short hexagonal glass rods with plane ends, in appearance resembling nothing so closely as the coloured chalks (except that they do not taper) used for writing on blackboards. Like the latter, they vary in colour; we have seen violet, light and dark blue, and even a white example. Such fragments as were sent us from Toronto are hard, and do not scratch with a knife, but the surface of the Stockholm example (violet) has softened to some depth, so that it is easy to scrape it into powder. The date attributed to these objects both by Professor Andersson and by Bishop White is Han; the specific gravity of three samples submitted by the latter varies from 3.03 to 3.19. Of five samples examined spectrographically, three contain barium in quantities T/M or M/L, the other two a trace only, and lead is present in considerable or large quantities. At first in doubt whether we were dealing with a frit or a glass (possibly incomplete), the presence of lead in all except the white



specimen, as well as the presence of barium, has led us to regard these coloured rods as glass. Moreover, as indicated (pp. 3—4), frit cannot be white. Spectrographic analysis of three specimens will be found in Table III. Sir Percival David has drawn our attention to a number of jade objects recorded in Chinese catalogues. These are round, square, or hexagonal, apparently 5—7 cm. long and perforated for suspension. The following description was kindly sent us by Sir Percival:

»*Han yü kang mao* (Han jade ornamental pendant). Hexagonal, length 2.4 ins., width of each side 0.21 ins. Translucent white jade with red spots. Equal sides, inscribed with six verses, the inscription totalling 24 characters, in the *ch'iai-shu* script. If not a Han piece, it must be of the Chin or T'ang Dynasties.»<sup>40)</sup>

We may tentatively suggest that the glass rods may be connected with the jades as cheap but durable substitutes for funerary purposes. On the other hand, they are not perforated, and there is no obvious reason why they should be coloured.

#### OBJECTS OF CLASS A. GROUP 2.

The next series of objects we shall describe are those belonging to our Class A, group 2. We have defined this group as comprising glass beads and plaques (generally of high specific gravity) with applied ornament as »eye» patterns, except in a few instances when the bead is ornamented with loop patterns. The objects of this group, generally beads or plaques designed as inlays, are made of glass throughout. They are usually decorated by coloured glass, applied so as to produce »eye» patterns, often complicated, which we shall presently describe. The glass body of the beads is usually some shade of blue, a few are greenish under strong illumination, some are black or almost so, while a particular type of rectangular bead has a body either colourless or of deep reddish brown. We have seen a considerable number of these rectangular beads, and examples are shown on Pl. V (No. 11) and Pl. II (No. 1). Occasionally the body even if spherical may be colourless, while the brownish body of a number of beads appears to be due to decomposition of the surface layers of an originally blue glass. Directly we begin to examine the beads of this group (A. 2) we find that our specimens fall into two very uneven sub-groups, dissimilar in appearance, technique, and specific gravity. The first sub-group, illustrated by all the Chinese beads of Plate I, is of high specific gravity, due to barium and lead content, and the beads bear designs that can be reduced to two main types:

(a) Simple or stratified eyes, often with rings of coloured glass disposed round the central element concentrically or eccentrically. (b) Compound eyes, already defined on page 23. Most beads of the first sub-group are spherical, not uncommonly they are cylindrical; sometimes they are knobbed or horned, when

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<sup>40)</sup> *Ku-yü T'u-pu*, 1779 edition, ch. 46, ff. 7a—8a; pls 7 and 8.

the designs upon them may become relatively complicated, though dependence on the eye or compound eye motif is generally obvious.

The second sub-group is constituted by a small number of blue eye-beads, having one edge of the eye broadened so that the outline of the eye becomes crescentic. We have only two examples of this form of Chinese bead, but deal with it at some length on pp. 35—37 on account of its important Near Eastern affiliations.

Of compound eye-beads, the specimen (S. 324) with white inlay on almost black glass, represented from two aspects at the top of Plate V, may be taken as typical in general appearance, as may No. 9 (S. 558) of the same plate. It should, however, be noted that No. 1 of this plate has a fine striated inlay at each pole surrounding its central bore, and of this we have seen no other example. Nos. 2 (S. 109), 3 (S. 560), 4 (S. 516), 5 (S. 750) and 8 (S. 157), are all examples of elaboration of the pattern in this group of beads, an elaboration which reaches its maximum in the magnificent bead in the Royal Ontario Museum reproduced as No. 4 of Plate III. The considerable amount of orange background which is introduced into some of these beads adds greatly to their aesthetic qualities. No. 6 (S. 114) of Plate V seems to represent another line of development, in which the blue and white stratified eyes on a dark ground are very striking. These are enclosed in diamond-shaped areas outlined by a double row of minute white dots. This type of bead includes a number of rather clumsily made examples, such as that (S. 16) shown as No. 9 of Plate I, in which the eyes are raised into irregular conical projections, contrasting with No. 7 (S. 346) of Plate V, where the eyes have become regularly stratified knobs. Sometimes beads of white or reddish brown, of oblong rectangular shape, carry blue and white stratified eyes, each eye overlapping an edge of the rectangle. These are the beads shown in Plate II, No. 1 (S. 98), and Plate V, No. 11 (S. 104).

A few beads of greyish-blue with white inlay may definitely be called horned. Almost the whole surface of S. 112 (Pl. I, No. 12) is occupied by mamillae of varying sizes, composed of alternate bands of white and greyish-blue glass, the body of the bead being of the latter colour. This specimen is almost identical with one figured by Bishop White from Lo-yang.<sup>41)</sup> Here again elaboration may take place. The bead just cited (S. 112) represents a simple form of horned bead, while an elaborate form with a compound eye is represented by No. 14 of Pl. I. Such beads may ultimately be derived from such simpler forms as that shown on Plate V, No. 7, and this may itself be genetically akin to such western beads as that in the Bern Museum (from Helliggen) shown in Fig. 2, which Professor Jacobsthal (to whom we are indebted for the photograph from which our drawing was made) dates to the third century B. C. This bead is blue, with blue and white knobbed eyes.

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<sup>41)</sup> *Op. cit.*, Pl. CLXIII, fig. 431.

Beads, and occasionally ornaments, with more or less simple or elaborated eccentric white stratified eyes (as opposed to compound eyes) occur, and are shown on Plate 1, No. 11 (S. 321) and Plate V, No. 10 (C. 33/2). The colour of the glass constituting the body of these beads seems usually to be yellowish brown or blue; in some instances there is no doubt that the superficial layers of an originally blue glass bead have turned yellow-brown.

An entirely different type of bead is shown in Nos. 13 (S. 219) and 14 (C. 32/275) of Plate V. These are of very heavy greyish white glass, and are ornamented with simple loops in black. They irresistibly recall a similar but smaller bead from the Mediterranean area (Rhodes) reproduced on Plate V, No. 12 (B. 2566), and it is noteworthy that both the Chinese bead (S. 219) and the Rhodian bead have very high specific gravities, 4.9 and 3.95 respectively. Both contain much lead, and the Chinese bead contains barium.

Compound eyes are not infrequent in European beads — indeed, we shall adduce evidence indicating, as we believe, that the Chinese compound eye is derived from the European — but in many instances the compound eyes of Chinese beads show peculiarities which, so far as we know, are never found in European examples. The first of these peculiarities is the flattening of the outer rim of the compound eye so that this becomes somewhat elliptical instead of circular. The other and more striking modification is the broadening of the white inlay on one side of the eyelets, so that this inlay appears crescentic or lunate rather than circular, producing, when the eyelets are correctly grouped, a peculiar revolving effect. This is so evident in many Chinese examples that there can be no question but that the inlay is designed to produce this effect, obvious in a number of beads that we reproduce and perhaps most developed in No. 13 of Plate I.

We may add a few words concerning the chemical composition of these Chinese eye-beads, which, as already stated, are of high specific gravity. With a single exception all the compound eye-beads referred by us to the pre-Han or Han group contain barium in amounts described as M. Strontium occurs in significant amounts (M) in two instances, and generally as T. Lead is recorded as L, except in one instance in which its presence is stated as M/L.<sup>42</sup>) Silver is generally present, as might almost be expected from the constant presence of lead. Tin may be present in significant amount. These then are the elements whose presence differentiates the glass of these Chinese eye-beads from the general conspectus of elements present in the Near Eastern glass recorded in Table I.

The exception referred to above is a compound eye-bead of typical appearance (S. 558, Pl. V. 9) examined by Dr. Brewer. This bead of bright blue glass has

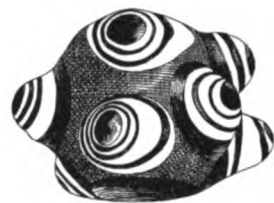


Fig. 2. Glass eye-bead, blue and white, from Helliggen (Bern Museum).

<sup>42</sup>) To Professor Yettis belongs the credit of first noting the high specific gravity of these beads and recognizing that they contained lead (*Illustrated London News*, May 12th, 1934).

six compound eyes each with seven eyelets. The inlaid colour has disappeared. Unlike the other compound eye-beads, it contains only small traces of barium and strontium, its main constituents being sodium, silicon, iron, and copper, with a considerable amount of tin and traces of calcium, magnesium, aluminium, lead, and potassium. Its low specific gravity (2.24) seems to set it apart from the beads in Table III.

### ORIGIN OF THE COMPOUND EYE IN CHINESE BEADS

We may now discuss the origin of the compound eyes found on those Chinese beads that we characterize as »pre-Han or Han». We propose to continue to use

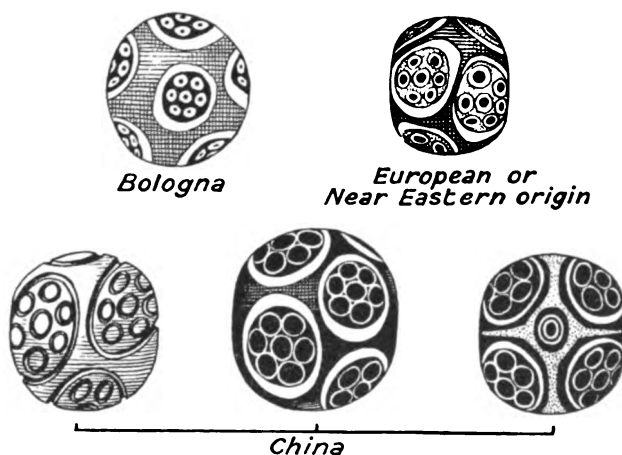


Fig. 3. Western compound eye-beads of the late centuries B. C., and Chinese compound eye-beads of pre-Han or Han date.

this rather broad grouping, though we consider that the date of at any rate the vast majority of the beads assembled under this heading is really pre-Han.

If we compare such compound eye-beads as those represented on Plate IV, especially Nos. 1 and 2, and Plate I, No. 4, from China, with Nos. 6, 7, and 8 of Plate I, of non-Chinese origin, it seems impossible to avoid the conviction that the ornament on the Chinese and non-Chinese specimens has a common origin. Not only do the compound eyes closely resemble each other in the simpler beads of each series, but each compound eye in the majority of instances carries seven eyelets, so arranged as to constitute a group of six surrounding one central eyelet. Indeed these numbers and arrangements commonly persist even when the background between the compound eyes carries differently coloured glass or is wholly or in part given to the development of new subsidiary patterns. Fig. 3 illustrates our argument in a slightly diagrammatic form.

The next step is to determine whether the ornament on the Chinese beads was derived from that on non-Chinese beads, whether the reverse occurred, whether both were derived from some intermediate source, or whether the similar, almost identical, ornament on both European and Chinese beads arose independently. We may at once say that nothing points to our fourth possibility. With regard to an Eastern or Western origin, the balance of evidence points conclusively to the latter. We can cite no instance of Chinese objects carried to the Roman Orient or to Europe in the centuries immediately preceding or following the beginning of our era leaving their mark on European or Near Eastern products.<sup>43)</sup> On the other hand, there are becoming known an increasing number of instances where western products have been carried to the East and have influenced the arts, crafts, and beliefs of China.<sup>44)</sup> We regard the patterns on these beads as yet one more instance of this process. In support of our thesis, and also as bearing on the date of these beads in China, we may note that not only are the multiple eye-beads of the kind we are discussing commonly attributed to about the fifth century B. C. in Near Eastern lands,<sup>45)</sup> but that we can adduce a number of examples from European tombs which permit of somewhat precise attribution to this period, namely to early La Tène, the beginning of the Late Iron Age. This is, for instance, true of northern France, where our best example is presented by the grave goods (indicating a date of La Tène I) from a burial at St. Remy-sous-Bussy (Marne), now in the National Museum at St. Germain-en-Laye, to which Mr. J. M. de Navarro has drawn our attention. A photograph of this grave group is reproduced on Plate XVI, and we take the opportunity of thanking Monsieur Lantier, the Director of the Museum, for kindly providing this. It will be seen that the largest bead on the twisted metal wire at the bottom of the photograph is a typical compound eye-bead with seven eyes. This bead has been described to us by Mr. de Navarro as a dark blue bead with three compound eyes, each with seven eyelets surrounded by a white ring which has partly perished. The height of the bead is 1.35 cm., and its diameter 1.65 cm.

Another example of this type of compound eye-bead is figured by Déchelette, after Jahn. It constitutes one element in an unusual necklace, composed of most varied beads and amulets, found in a tomb at Kertch in the Crimea. Apart from the compound eye-bead, the necklace contains a number of stratified eye-beads but no beads with a wavy line. Although Déchelette does not venture an exact date for this necklace, the text suggests that he considers it not later than La Tène II. It is noteworthy from the point of view of the three lions to which we refer on page 11 that this necklace, which besides beads contains many apotropaic amulets

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<sup>43)</sup> Silk had a profound cultural influence, but probably not a technical influence before the fourth century A. D.

<sup>44)</sup> C. G. Seligman, 'The Roman Orient and the Far East', *Antiquity*, vol. XI, 1937.

<sup>45)</sup> Gustavus Eisen, 'The Characteristics of Eye Beads from the earliest Times to the Present', *American Journal of Archaeology*, Second Series, Vol. XX, 1916, No. 1.

(phalli, a scarab, etc.), also contains two small animals on plinths, one of which may well be a lion such as we have already figured on Plate IV.<sup>46</sup>) South of the Alps the date may not be very different. At Certosa (Bologna) an example — slightly atypical in that the compound eyes contain only six eyelets — has been found in a grave (No. 7), a single interment, which also contained an Attic black figured lekythos.<sup>47</sup>) We are indebted to Mrs. J. D. Beazley for drawing our attention to this, and also for informing us that the lekythos is by the Gela painter and belongs to the very beginning of the fifth century B. C. Each compound eye of this bead has a central eye and five peripheral eyes.



Fig. 4. Compound eye-bead from Certosa (Zannoni, Pl. 48, fig. 7).

The dates we have cited for the compound eye-beads from Certosa and St.Remy-sous-Bussy apparently give us the earliest dates for these beads on the Continent of Europe, but examples seem to have persisted for hundreds of years. In Great Britain half of one of these beads was found at Silchester (Pl. I, No. 8), where, as Professor Collingwood tells us, it cannot antedate 50 B. C.

We have derived the ornamentation on a group of Chinese beads from that of a western type occurring in Europe in the fifth century B. C. If it were not for the presence of the same ornament on Chinese bronzes that may be dated earlier than 1,000 B. C., we should consider that our argument required no further discussion. We do in fact believe that the view we have put forward is correct, but it is obvious that in the circumstances some further consideration is appropriate, and it will be necessary to outline briefly the time element in the different phases of bronze ornament up to and including the Han period, so far as this particular design is concerned. Several schemes have been proposed. That suggested by Professor Yelts is perhaps the most acceptable, since it deals directly with types of design as such, and though easily correlated with historical happenings does avoid the suggestion that the life of a style, even if associated in the main with a certain period of history, has no survival at the end of an historical period. This scheme has the added virtue that it agrees closely with that put forward independently by Professor Karlgren in his comprehensive work *Yin and Chou Researches* (1935), although Karlgren's two first periods are fused into one.

The three phases defined by Professor Yelts are as follows:<sup>48</sup>)

»(1) The First Phase includes those displaying the standards established in the Shang-Yin period, and it lasted from earliest times to the tenth century B. C.

(2) The Second Phase includes the style distinctive of Chou culture, and it

<sup>46</sup> Déchelette, *Manuel d'Archéologie*. Paris, 1914, vol. II Pt 3, p. 1318 fig. 575, The text figure is a reproduction of what is obviously a not very careful drawing.

<sup>47</sup>) Zannoni, *Scavi della Certosa di Bologna*, Pl. XXXVIII: 7.

<sup>48</sup>) We have kept Professor Yelts's words as they appeared in the *Burlington Magazine* of Jan. 1936, p. 22, but have divided the quotation into three paragraphs.

lasted from the tenth century to dates which varied in different parts of the country.

(3) The Third Phase corresponds generally to what is known as the Ch'in or Huai style. Again there is variation according to locality; one of the earliest examples belongs to the Ch'in State, and probably was cast at the end of the seventh century B. C. Thus the end of the Second Phase and the beginning of the Third overlap, if China from the seventh to the third century be regarded as a homogeneous single unit. During these five centuries especially, many different centres of civilization existed.»

There is no difficulty in finding the compound eye in bronzes of the First Phase, which in a general way corresponds to the Shang-Yin and the beginning of the Chou periods (Professor Yetts tells us that its inscription almost certainly dates

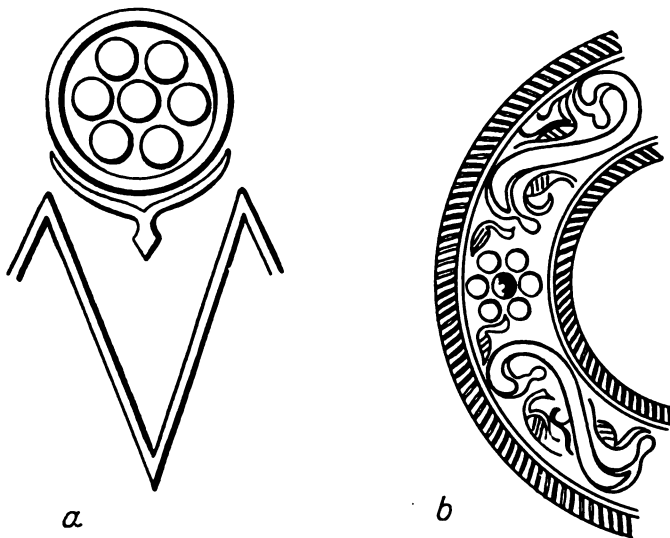


Fig. 5. Compound eyes on bronzes, from (a) First Phase axe (B. Karlgren), (b) mirror of Han date (R. W. Swallow).

one bronze to the third Chou king), nor in the Han period posterior to the Third Phase, and examples are shown in Fig. 5,<sup>49)</sup> but, so far as we can ascertain, the compound eye does not occur in the Second Phase.<sup>50)</sup> In this Professor Yetts is inclined to agree with us. The example shown in Fig. 5 b may be regarded as of Han date; the question then arises whether there is clear evidence of the

<sup>49)</sup> The drawings in this figure are taken from B. Karlgren, 'Yin and Chou in Chinese bronzes', *Bulletin No. 8*, Museum of Far Eastern Antiquities, Stockholm, 1936, Pl. XXVIII, A. 187, and R. W. Swallow, *Ancient Chinese Bronze Mirrors*, 193, Pl. 52.

<sup>50)</sup> The disappearance of certain types is emphasized by Professor Karlgren, who points out that many well characterized bronzes including the square *ting*, the *ku*, and the *chüeh*, all fully developed in Shang-Yin times and surviving through the early Chou period, 'disappear entirely in Middle Chou and Huai' times. (Karlgren, *op. cit.*, p. 135.)

existence of these compound eyes in the Third Phase style, often called Ch'in or Huai? So far as Professor Yetts knows, there is not, but it should be remembered that the earliest mirrors have not yet been dated. In either event it is necessary to emphasize the distinction between the compound eye and the circular generally raised convex ornament, called in Chinese catalogues *yüan wo* — round eddy — »likening it to water in swirling motion»,<sup>51)</sup> for if we are right in our argument that the compound eyes on »pre-Han or Han» beads are derived from western prototypes there is not even a genetic relation between it and the *yüan wo* in the Third Phase or later. We are in fact in the presence of an interesting case of »convergence», using the term in its anthropological sense, and though experience suggests that convergence should not be lightly invoked we believe that we may fairly do so in the present instance.

### BEADS WITH »APPROACHED» EYES

There is another type of bead with stratified eyes which we must consider here on account of its western origin, though we shall have more to say concerning this type later when discussing composite beads (our Class B.). The beads we now refer to are those with concentric eyes of such considerable size that, arranged in couples one above the other, the eyes closely approach or even impinge upon each other. These eyes are well described by Eisen<sup>52)</sup> as »approached». The appearance of the beads is very characteristic and evidently expresses a different idea in decoration from those in which the eyes are scattered irregularly or are completely separated from each other. Déchelette illustrates two beads with »approached» eyes, exactly resembling in appearance our Chinese specimens, from Germany, dating from the end of the Hallstatt period,<sup>53)</sup> though they do not appear in France until early La Tène. The glass constituting the body of the European beads may be orange, or blue-green. We have no Chinese specimen in which the body is of a yellow or orange colour, nor have we seen examples in other collections from China. Our beads with approached stratified eyes are all blue, and since they are of the composite type described on pages 40—45 and were made in China it would seem, judging from our somewhat limited material, that the western beads which they imitated were subsequent to the end of the Hallstatt period; this agrees well with the number of blue beads with concentric stratified eyes that have been found in northern Europe, attributed by Déchelette to La Tène I and II.<sup>54)</sup> It is perhaps noteworthy that we have not from Chinese sources any bead of this type with spiral eyes such as occur in Europe, though a

<sup>51)</sup> Yetts, »An early Chou Bronze», *op. cit.*, Vol. LXX, 1937, 1, p. 168.

<sup>52)</sup> *Op. cit.*, Pl. I and p. 26.

<sup>53)</sup> *Op. cit.*, Vol. II, part 2, p. 870, fig. 364. For a La Tène specimen see Vol. II, part 3, p. 1315.

<sup>54)</sup> Déchelette, *op. cit.*, p. 1315, fig. 573. Eisen, *op. cit.*, Pl. I, fig. 53, figures a blue-green bead in the Museo Etrusco, Rome, with approached eyes, dating to the fifth century B. C., which he states is the commonest form in Etruscan tombs.



further link with north-western European types is afforded by the presence of a number of beads with blunt conical projecting eyes.

We may make one further observation concerning the distribution in Europe of these beads with blue glass bodies and »approached» eyes. We have had the opportunity of examining the rich collections of beads of Viking age exhibited in the National Museums of the capitals of the three Scandinavian States, and also in the Museum at Upsala with its pre-Viking material. Nowhere did we see beads of the approached eye type such as we figure on Plates II and IV (Nos. 1—4). Eye-beads there were, but of other appearance. One, from a Viking grave of the tenth century at Tuna in Alsike, Upland Province — for which we are indebted to Dr. T. J. Arne — had a specific gravity of 2.51 and was a sodium-calcium-lead-tin silicate with traces of bismuth, silver, copper, zinc, magnesium, iron, chromium, manganese, vanadium, boron, arsenic, antimony, and cobalt, but no barium or strontium. There is nothing unusual about the spectrographic analysis, though since it exists it seems advisable to record it; the interest of our observation is that among many hundred beads buried with their women by those keen collectors the Vikings, there were no examples of a type of bead traded over much of Europe and Asia in the centuries immediately preceding and following the beginning of our era. The export of this bead from the Mediterranean area, and presumably its manufacture there, must then have ceased by Viking or pre-Viking times.

#### BLUE AND WHITE EYE-BEADS OF CLASS A, GROUP 2.

We have mentioned on p. 28 the existence of a few beads of Chinese origin constituting a sub-group within Class A. 2. Of this sub-group we have only two examples (Fig. 6, c and d). Both are of blue glass, and carry a large number of stratified eyes. From the standpoint of their design, these beads must be considered with such glass plaques as that figured as No. 2 of Pl. IX. (T., N. B. 2452.) As in the plaque, it will be noted that one edge of many of the eyes is broadened,

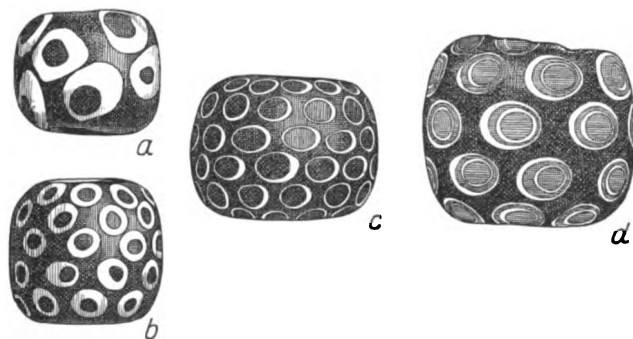


Fig. 6. Blue and white eye-beads, a and b western, c and d Chinese.

giving the crescentic or lunate appearance to which we have already referred. We have little doubt that these Chinese beads are derived from a type of blue bead with white eyes which was in circulation over a considerable area in La Tène times. These beads have a blue body, inlaid with white rings which may be few in number or very numerous, and an irregular broadening of the outline of some of the eyelets, which we take to be accidental, is not uncommon. A considerable number have been found in Syria, and the Beck collection contains examples from that area. One of these is shown in Fig. 6 a, as is a presumed European (La Tène) example (6 b). Even in these specimens a number of the eyes are beginning to show a unilateral asymmetry, which in some instances might almost be called crescentic or lunate, though, as we have just said, we do not think this was intentional. Further, there are in the Ashmolean Museum, Oxford, two examples from Al Mina (Syria), where they occur in what seems to be a fifth-fourth century context. We believe that it is this type of bead that has given rise to the Chinese examples bearing eyes each with a regularly thickened lunate edge. The four examples illustrated in Fig. 6 are arranged to show the line of development that we have in mind. Here again, although the evidence is not complete, it is difficult not to believe that the Chinese beads are derived from the western, the occasional eccentricity in the eyes of the latter having become systematized. Something approaching an asymmetrical edge to the »eye« occurs in the very beautiful glass bead in the form of a *watchet* eye from Egypt, now in the British Museum, reproduced as No. 5 of Pl. III.<sup>55</sup>) This specimen Mr. Sydney Smith dates as not later than the fourth century B. C., although it may be considerably earlier.

The date of the European examples is particularly well defined by a number of beads in the Musée des Antiquités National, Saint-Germain-en-Laye. We need only mention two, those constituting part of the early La Tène grave-group (No. 67839) from St. Remy-sous-Bussy, to which we have already referred (p. 31) as accurately dating the European compound eye-beads, and another series, from Bussy le-Chateau. A photograph of part of the latter series is reproduced in the lower register of Pl. XVI. The association with a central compound eye-bead will again be noted, though no objects precisely dating this group were found, indeed it is possible that the beads came from more than one grave.

Blue and white beads of the type we are discussing also occur in Great Britain. One of the best examples comes from the Meare lake-village near Glastonbury. We are informed by Mr. St. George Gray that this bead (figured on Plate XVI, lower right hand corner) was found between two layers of clay outside the area of Dwelling Mound VII, and that it should be dated to the period *circa* 100 B. C., or possibly not quite so early.<sup>56</sup>)

<sup>55</sup>) The specific gravity of this bead as determined by Mr. H. Plenderleith is 2.48.

<sup>56</sup>) This bead is exhibited (No. G. 8) in the Somerset County Museum, Taunton Castle. For permission to reproduce a photograph we are indebted to Dr. A. Bulleid and Mr. H. St. George Gray.

On spectrographic analysis the two western and the smaller simpler of the Chinese beads shown in Fig. 6 exhibit an amazing resemblance. All three are sodium silicates, with traces or small quantities of calcium and other alkalis; all have a trace of strontium, and the Syrian and Chinese beads have a trace of barium, this being absent in the »European« bead. All contain lead, but the Syrian and European beads only traces while the Chinese bead is registered T/M. It is not surprising that the specific gravities of these beads also lie close to each other. That of the Syrian bead is 2.33, of the European 2.29, and of the Chinese 2.52, while two other Syrian beads in the Beck Collection with 30 and 40 eyes have specific gravities of 2.36 and 2.29 respectively. With regard to the fourth bead, S. 20 (Fig. 6. d, specific gravity 2.51), barium is present in minute traces in the white portion of the eyes of this bead and in rather larger traces in the glass constituting the body, which in spite of its dark colour contains no cobalt but only copper; traces of lead are present.

We have laid considerable emphasis on the fifth century B. C. as the time of origin of the European beads that influenced China. It must not, however, be thought that apart from such Bronze Age contacts as we have referred to in our footnote on page 1 there were not other contacts during the European Iron Age. A bronze sword in the Eumorfopoulos Collection (British Museum), which has been figured several times, is in its modified antenna form of handle suggestive of the Hallstatt type, to which it has been compared by Dr. Olov Janse who figures it beside a Danish specimen.<sup>57)</sup> A further paper by Janse records other examples of seemingly Hallstatt affinities,<sup>58)</sup> while we may draw attention to the pottery object represented in the lowest register of Plate VII, for knowledge of which we are indebted to Professor P. Jacobsthal. This was found in Mayen in the Rhineland, and Professor Jacobsthal informs us that it is certainly of Hallstatt age, say between 700 and 500 B. C. in that part of Europe from which it hails.<sup>59)</sup> Without wishing unduly to emphasize its importance from the standpoint of the matter under discussion, it does seem to us that this specimen has a suggestive resemblance to some of the knobbed and horned beads figured on Plates I and V.

### PLAQUES AND INLAYS

Besides eye-beads, the China of pre-Han or Han times produced plaques of glass for inlay in metal work. These plaques are generally circular, of moderate

<sup>57)</sup> O. Janse, »Épées anciennes trouvées en Chine«, *Bulletin of the Museum of Far Eastern Antiquities* (Stockholm), No. 2, 1930, p. 74. Its possibly Scythian affinities have been indicated by Minns (*Scythians and Greeks*, p. 69), and emphasized by Yetts (*The Eumorfopoulos Collection* (Bronzes), Vol. I, A. 156, p. 68), who appears to discount the Hallstatt relationship.

<sup>58)</sup> O. Janse, »Quelques antiquités chinoises d'un caractère Hallstattien«, *op. and loc. cit.*, pp. 177—192.

<sup>59)</sup> For permission to reproduce these photographs we are indebted to Dr. E. Neuffer, Director of the Rheinisches Landesmuseum, Bonn.

size for inlay into robe hooks, but larger pieces also occur such as that reproduced on Plate IX, No. 2, from the Royal Ontario Museum of Archaeology. Another example is shown in Fig. 7. In this specimen the glass disk is inlaid in a silver tube. A number of similar objects are known, so closely alike that they may be thought to have been cut from a single hollow handle (?) of a metal vessel; the edges of the metal indicate that the section was made in ancient times.<sup>60</sup>) Plaques are either plain, of greenish glass, or inlaid with coloured glazes to form »eyes», or patterns apparently derived from eyes. The glass may or may not contain barium and lead, and it appears that in this respect there may be a difference according to whether the plaque is ornamented or plain. It is at any rate noticeable that the unornamented plaque of greenish glass inlaid into robe hook S. 31 (Pl. VIII, No. 1) contains no barium, and that the remains of the eye-plaque in S. 32 (Pl. VIII, No. 2) contains barium T/M. Further, of two glass plaques in the Cambridge

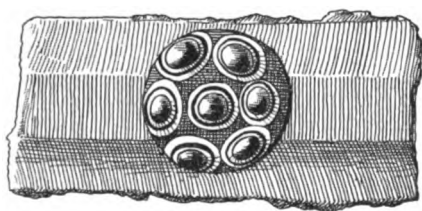


Fig. 7. Eye-plaque in silver mount  
(Table IV).

Museum, the plain specimen (Pl. IX, No. 6) contains only a trace of barium while for the glass of the polychrome plaque with central compound eye (Pl. IX, No. 5) barium is recorded as M. We may add that the colourless plano-convex plaque — if plaque it be — (S. 102) contains no barium.

On Plate VIII, Nos. 1 and 2 (S. 31, S. 32) of the three robe hooks illustrated resemble each other in style and are obviously of the same age; their style indicates Han, or, according to one good judge, immediate post-Han date. The body in both specimens consists of an upper and lower (nearer the shank) half, the upper carrying a moderately stylized animal head; the rest of the body presents a series of scrolls and whorls in rather deep relief, with a glass plaque inset at the base of the shank of the hook. Both specimens are gilt. In robe hook No. 1, besides the inlay of greenish glass at the base of the shank, there are two much smaller pieces of red inlay constituting the eyes of the monster. The inlay of robe hook No. 2 consists of the much corroded remains of a glass eye-plaque. The right eye of the head of the monster presents a hollow which presumably once carried an inlay. The left eye still carries an inlay, which appears to resemble that in the eyes of No. 1, but is not sufficiently well preserved to permit of a definite statement of its nature.

In No. 1 the insets forming the eyes of the monster are of dull red colour, and before spectroscopy were considered to be carnelian; the spectroscope however shows that they are glass, and if the date assigned to the specimen be correct, these two small inlays are the earliest examples that we know from China of a transparent red glass. There is, however, no reason why such glass should not

<sup>60</sup>) There is a specimen in the Museum of Far Eastern Antiquities, Stockholm, and two examples are figured by Bishop White, *Tombs of Old Lo-yang*, Pl. CLXV, No. 40.

occur, for although a transparent red is not present in any of the compound eye-beads that we figure, the ground colour of the cylinder bead (S. 223) represented as No. 2 of Pl. II is of an opaque reddish brown, while that of No. 1 (S. 98) is a richer brown. Both specimens are coloured with copper, and we may deduce from the recent experimental manufacture of a relatively large amount of red glass by the late Sir Herbert Jackson that the copper colouring was added to the glass mixture in the form of cuprous oxide. Owing to the high temperature to which the beads were submitted during manufacture, a large amount of the copper salt was dissolved in the glass and on cooling precipitated in the form of minute particles of metallic copper, this change taking place at a temperature of about 900° C. The rectangular bead (S. 98) has been examined spectroscopically (Table IV), and contains a considerable amount of barium. As further evidence of capacity to colour transparent glass, we have in our possession a cicada of transparent greenish-blue glass (p. 26) with high barium content, and therefore, as we believe, of Han date or earlier, while Bishop White has seen a glass *pi* of emerald green colour from Shou Chou which — as he writes to us — he considers to be »undoubtedly of the third century B. C.»

Robe-hook No. 3, about 18 cm. long, of gilt bronze, from the collection of H. R. H. the Crown Prince of Sweden who kindly allows its reproduction, is perhaps the finest specimen we have seen. Its main portion consists of a stylised dragon, the body being represented in wavy coils. The concavities of the coils are occupied by three circular glass plaques of green colour, each with seven eyes. These are stratified, so that the layer of white glass which forms the white edge of the eyes extends beneath the latter. The reflected light from this white layer makes the green centres appear lighter in colour than the main body of the plaque. Originally there were four or five glass plaques, but one if not two have fallen out. The eye of the dragon is apparently of turquoise. We have no doubt that the glass plaques are contemporaneous with the metal. The lowest coil of the dragon ends on the shank of the hook. The upper end of the hook is constituted by a monstrous head assailing the dragon, while the hook is itself a dragon's head.

The eye-bead glass-plaque ornamentation was occasionally applied as a glaze, as in the unusual pottery vessel in the Sedgwick Collection, reproduced on Plate IX; this is the fellow of a specimen from the Nelson Gallery of Art, Kansas City, shown at the Exhibition of Chinese Art at Burlington House (No. 118), where it was attributed to the period of the Warring States, i. e. late Chou. There were even glass vessels in which the body consisted of green-blue glass, the surface decorated with the familiar compound eye design. A fragment of such a vessel, now in the Royal Ontario Museum of Archaeology, is figured by Bishop White in *Tombs of Old Lo-yang* (Pl. CLXII, Fig. 427.<sup>61</sup>) Since no photograph can do

<sup>61</sup>) This fragment has been figured by Professor Yetts in *The Illustrated London News*, loc. cit., where the above mentioned bowl from the Sedgwick collection was also reproduced.

justice to this glass, Bishop White has had prepared for us the representation in colour reproduced on Plate III. A fragment examined spectrographically showed considerable quantities of both barium and lead (Table IV).

Of the same technique as the Sedgwick vessel, and apparently with the same soft body, is the pottery bird in the possession of Mr. Eumorfopoulos, reproduced as No. 4 of Plate VII. The body of the bird is covered with a creamy white glaze, with areas of dark glaze as shown in the photograph; there are also patches of pale blue glaze full of bubbles between the brown tail patches, while the wings are blue, as are the eyes. The distribution of the blue glaze is represented fairly well in the photograph by the area over which the glaze appears rough, owing to the bubbles, broken and unbroken, in the blue glaze.

### OBJECTS OF CLASS B.

We have defined the beads of this group as »composite», i. e. they do not consist of more or less homogeneous glass throughout but have a central siliceous core of glass-faience or exceptionally of quartz granules. Mr. G. F. Claringbull kindly arranged for X-ray diffraction photographs to be taken of the cores of two beads, S. 2 and S. 18. These indicate that the cores are of glass, i. e. there is no evidence of crystal structure nor is there any indication of the presence of tridymite or of any other mineral. The core, which appears to have



Fig. 8. Diagram of composite bead.

been carefully moulded into shape before heating, is covered with a relatively thin layer of glaze upon which ornament is superposed. Fig 8 represents diagrammatically a usual type of compound bead of which examples are portrayed on Pl. II, Nos. 7—12, and indicates its structure.

It will be immediately obvious that the ornament upon Nos. 7 and 8 may be derived from that on such knobbed eye-beads of European origin as shown in Fig. 2 (p. 29).

Sometimes the core may consist of little more than compacted sand, so loosely held that it pulverises on scratching with the finger nail, but this we believe is not common. The material more frequently used to form the core is a mass of powdered glass fragments cemented together to form a substance similar to faience, which we shall call »glass faience». This may be hard and compact, or soft and containing such large air spaces that in many instances they are to some extent visible to the naked eye. The friability of other beads lies between these extremes, and it is probable that, were a sufficiently large number of composite beads to be examined, so much variation in hardness would be found as to constitute a continuous series running from the softest to the hardest.

In order to understand the structure of some of our Chinese composite beads we have found it necessary to examine specimens of faience and glass from other countries. Quantitative chemical analysis of our Chinese specimens with composite core has only been possible in five instances, but we have supplemented these by examining with the microscope fragments scratched from other specimens, and in some instances have cut sections from pieces purposely detached. These supplement the analyses by Mr. Cook and the spectrographic examinations made by Dr. Ritchie.

One of us has already published some account of certain forms of Egyptian faience<sup>62</sup>). This is in most cases made of finely ground grains of quartz mixed with a small quantity of lime and/or soda. When heated, the surface of the quartz grains is slightly dissolved forming an alkaline silicate which solidifies as it cools.

This material is isotropic, that is to say it has no power to rotate the plane of polarisation when examined between crossed nicols. The examination of a typical faience bead from Tell el Amarna, firstly with ordinary transmitted light and secondly with polarised light with crossed nicols, will show no field of vision in the latter instance if the specimen be completely isotropic, for what should be the field will be black and the isotropic material, since it does not rotate the plane of polarized light, will remain invisible. With crossed nicols, quartz grains, of which Egyptian faience is largely made, will, on the contrary, be seen brilliantly white, because, being bi-refrangent, they do rotate the plane of polarised light. If, however, we examine a section through a composite Chinese bead of Class B, such as the bead already shown on Plate II, No. 5 (our section being magnified some 50 diameters), we shall find that whereas under normal light the core shows many transparent specks of considerable size, most of these completely disappear in polarized light, indicating that they are isotropic. They are, in fact, powdered fragments of glass, crushed before being mixed, and fused as a faience, which now appears as a practically isotropic material containing a few grains of quartz. This is the material that, as already stated, we propose to call glass faience, and we would again emphasize that it may be surprisingly soft and friable and vary greatly in chemical composition.

The fact that the cores of certain beads of this isotropic faience contain barium proves that it is a manufactured material produced by fusing its elements together, for there is no natural compound of barium that is isotropic. The cores of such beads as are shown on Plate II, No. 6 and Plate VI, No. 2, are of hard greyish material, and barium in moderate amount is present in the spectrogram of the latter; the former has not been tested. Dr. J. F. S. Stone has kindly examined the softening and melting points of a bead of this type (closely resembling No. 6 of Plate II). The core was still intact at  $1,400^{\circ}$  C., with no sign of deformation. The glaze began to melt at  $1,000^{\circ}$  C. and ran at  $1,250^{\circ}$  C. Of the coloured glazes all except blue regained their colour on cooling. The blue became white, and appeared

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<sup>62</sup>) H. C. Beck, *Qau and Badari*, Part II (1928).

to decrease in volume, as if partially volatilized, and it also had the highest melting point (over 1,250° C.) of the glazes. We may add that in this type of bead the surface of polychrome glaze is sometimes extremely thin.

It is surprising that glass faience such as we have described has not been reported as existing in specimens from countries other than China; possibly it was never made elsewhere, but this conclusion can only be tentative until many more beads have been examined.

The bead figured on Plate VI, No. 7 (S. 4), differs from the other Chinese beads we have examined in that it has a quartz faience core more closely resembling the faience of some Egyptian beads. It is, however, composed of much larger grains of sand, which seem to be natural uncrushed grains of a more or less uniform size, and in this it differs from most Egyptian specimens, in which the grains of quartz have been crushed. Many of the quartz grains have a brilliant red colour on the outside, due to staining with iron. The appearance in section is astonishingly like sand that is only lightly held together. The only difference between a section made of this core and a section made from a lump of sand from a Sussex sand quarry was that the grains in the bead (we are still writing of S. 4) were mostly 0.1—0.15 mm., whilst the sand from the quarry had grains that were, many of them, from 0.17—0.25 mm. in diameter. The moulded core appears to have been covered with a rather opaque white glaze and this has penetrated the core for only a short distance; on its outer surface is a thick layer of pale blue glaze with eyes, as in other of the harder cored beads of this class.

Glass faience beads, including the bead S. 4, all have a layer of glaze of considerable thickness covering the core. This is clearly shown in Plate VI, especially in No. 9 (S. 1), where it appears as the light band immediately overlying the darker core. Under the microscope the glaze is seen to be full of bubbles and to be a more or less isotropic material containing great quantities of small pieces of quartz, i. e. it is a true but very impure glass. In a number of beads with a really soft faience core, beneath the surface glaze there is a thin layer of a very opaque white glaze, which can scarcely have been put on in the same manner as the thicker layer of glass on such beads as S. 1. This white layer seems to sink into the core for a short distance.

To return to the distinctions between Chinese glass faience and Egyptian or Aegean faience, it should be noted that whereas the latter has from 95 % to 99 % of silica, no specimen of the former that has been analysed has a higher percentage than 68 %. The hardest Chinese glass faience has under 50 % of silica and some 17 % of barium; the softest cored bead has 68 % of silica, with no barium or lead discovered in the chemical test, although traces of both were found in the spectrogram.

The beads with the most gaily diversified surface, i. e. with the greatest number of coloured glazes most liberally applied, constitute a sub-type of Class B. Nos.



5 and 6 of Plate II and No. 2 of Plate VI illustrate such specimens. In these the layers of glaze constituting the pattern are surprisingly thin; a section through a red-brown line of one of these beads shows that it is only 0.17 mm. thick. This brown material is a ferric oxide glaze, and though it originally had an extremely vivid red colour it is now completely opaque. The composite beads in the second row of Plate II indicate how extensively this glaze was used.

It will be noticed that the example of this type of bead reproduced as No. 6 of Plate II (C/32) retains traces of the compound eye design, though these are very degenerate. In this specimen, the dots representing the compound eye are reduced to four in number, are insignificant in size, and tend to be arranged at the corners of an imaginary rectangle. In other specimens of the same type of bead the compound eye is rather less degenerate, as in one bead on which some of the eyes carry five peripheral dots arranged round a central dot, but in all these beads there is a tendency for the compound eye to disappear. In one example in which it has disappeared, the pattern on the bead might best be described as a series of diamond-shaped spaces outlined in brown glaze, the centre of each space being occupied by a slightly projecting stratified eye, brown, white and blue, rising from the surface, while the broad brown outlines of the diamonds are in part occupied by oblong stratified areas, blue and white.

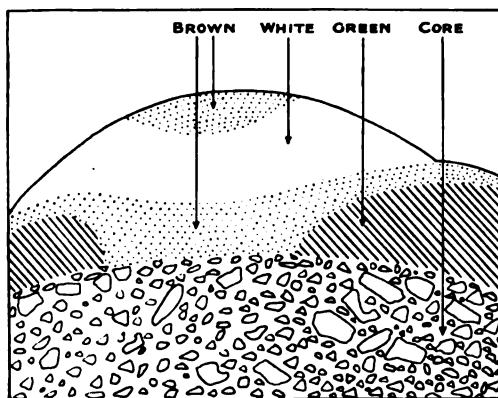


Fig. 9. Face of section (x 15) through composite bead (S. 2, Pl. II. 7), from photograph by Dr. Ritchie.

A diagrammatic representation of the superficial layers, including an eye, of bead S. 2 (Pl. II, No. 7) is shown in Fig. 9. This shows the core, the darkest part in the original, over which is spread four layers of glaze constituting the brown and white stratified eye. It will be seen that the main mass of green glaze has not penetrated the core, and at the base of the eye it has been pressed away from the core by the brown glaze. This section should be compared with the slightly magnified median surface of bead, S. 1, Pl. VI, No. 9. The contrast with the section of the Egyptian bead (Pl. VI, No. 8) in which the stratified eye is pressed into the glass of the body of the bead is very noticeable.

In the glazes of such beads as are represented on Plate II, Nos. 4 and 5, particularly the orange and white layers, there are a number of spherical objects which look like bubbles, but they do not show the brilliant reflection that a bubble usually shows. These structures were very puzzling, but after cutting sections we considered that they probably arose during manufacture, as bubbles of a gas, on the inner surface of which a solid deposit has subsequently formed. When a portion

of the sandy part of a core that has almost completely corroded away is examined under the microscope, these microspheres become interesting objects. The larger ones polarise in colours showing red and green line patterns over them.

In some of the softer cores a special feature is present which we suppose to be due to a desire to prevent the distortion of the core, though, as we shall presently indicate, magic may have played a part in some instances. When an eye-bead such as No. 9 of Plate II is cut across so as to expose a longitudinal section, two well defined grooves are usually noticeable in the substance of the core, and such grooves are well seen in No. 5 of Plate VI. The grooves do not usually contain any visible traces of metal, and their origin is difficult to explain. We discovered in one bead of different size and appearance (Plate II, No. 3) two thin gold circular bands embedded in the substance of the bead, as shown in Fig. 10. These bands probably constitute a clue to the grooves, but one that we are quite unable to follow up. If it be argued that the grooves were caused by metal rings, these could

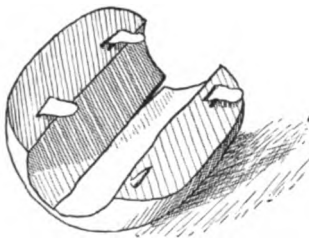


Fig. 10. Section of composite bead (Pl. II, No. 3), showing gold bands in substance of bead.

not have been of copper or bronze since there is no trace of staining with blue, and copper silicate (the result of the interaction of copper, even in small amounts, and alkaline silicates) gives an intensely blue colour. Nor do we think that the grooves are due to iron rings, although this metal seems to have been known in China as early as the fifth or fourth century B. C. On the other hand, the late H. H. Thomas has pointed out to us that iron such as a cylindrical cocoa tin can be completely dissolved in quartz faience, but we do not think that this has any real bearing on the grooves. As to the gold bands in specimen No. 3 of Plate II, we do not hesitate to suggest a magic purpose, for it is well known that in ancient China gold was considered to have lifegiving properties.<sup>63</sup>)

Plate VI, No. 6, represents one of the simplest composite beads we have examined. There is a central pinkish core, covered with a layer of olive green glaze, with white stratified eyes.

Apart from composite beads of the types described in the last few pages, we have seen only one other object of comparable composite character. This is a ring (S. 88), 32 mm. in maximum diameter, consisting of a hard brownish core so porous as to appear almost spongy in section. This is covered with a layer of dark blue-green glaze, which on the surface has assumed a dull almost lacquer-like appearance. The hollow centre of the ring is spherical, the inside regular with no overlap, so that a radial section of the ring is shaped like a *sans serif* capital D. The surface of the ring is ornamented with a design consisting of a four-petalled flower repeated four times. The centre of each flower consists of

<sup>63</sup>) A. Waley, 'Notes on Chinese Alchemy', in *Bulletin of the School of Oriental Studies*, Vol. VI (1930—32), especially pp. 2 and 11.

an indented diamond-shaped area of an almost golden-yellow friable glaze. Grouped round this are four oval slightly depressed areas in the blue-green glaze; these were formerly filled in with colour, probably white. Examined spectrographically, the surface glaze and the golden surface ornament are essentially calcium-lead silicates, the core a calcium silicate, while all three contain a trace of barium. In shape and size this object is reminiscent of a lapis ring with gold inlay figured by Stein<sup>64</sup>), but this does not offer any suggestion as to date, for the site on which Stein found his lapis specimen is not accurately dated.

### THE BUCKLEY BOWL

Having, as we believe, produced conclusive evidence for an abundant output of native glass and a high degree of skill in working it, we may turn our attention to the magnificent specimen shown on Plate XII, which we propose to call the Buckley bowl in memory of its late owner. Wilfred Buckley formed a large collection of glass, which at his death passed to the Victoria and Albert Museum; most of this glass was European, but there were also objects of Far Eastern origin, among them the unique example which we shall now discuss. The general character of this vessel is well shown in the reproductions, though attention may be drawn to the pontil mark and the concentric character of whorls which arise from it. The surface of the glass has corroded to a considerable extent, as can be seen in the plate, giving rise to a somewhat dully patinated surface which increases the beauty of the specimen; the glass itself is somewhat opaque, of a brownish-green tint.

The bowl certainly came from China, and though, as we shall see, there does not seem to be much doubt as to the answer, it is a fair question for consideration whether it was made in China or in the West. Since its unique quality renders chemical analysis impossible, we can only follow the opinion of experts. We have consulted a number of these, including Messrs B. Rackham, R. L. Hobson, and D. B. Harden; all are agreed that it is not of the Roman Orient, or at least that they have seen nothing like it from the Near East. On the other hand, we are struck by a certain resemblance in appearance and perhaps in technique to a number of »Roman» vessels and bowls. We have in mind especially the shallow ribbed bowls which occur with special frequency in Eastern Mediterranean lands. In the majority of these the ribs are vertical, but examples do occur with ribs sloping obliquely, so that if these were continued on the base of the vessel they would at any rate approach each other so as to form an incomplete whorl.<sup>65</sup>) Actually the base of the majority of those bowls that we have examined are smooth, either the pontil mark has been ground away or the bowls were cast, but in others,

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<sup>64</sup>) *Serindia*, Pl. IV., Yo. 00101 a.

<sup>65</sup>) It is perhaps worth noting that these bowls probably go back to a metal form, such as the bronze omphaloid bowls of the fifth and fourth centuries B. C. found in Syria; these were presumably moulded.

such as that reproduced on Plate XIII, No. 1 (B. 652) the pontil mark is well shown. Such a specimen may well be as early as the first century A. D., while the whorled glass vessel (V. and A. 5217—1901) of western origin, also reproduced on this plate (No. 2), has a suggestive resemblance to the Buckley bowl. The western specimen is considered by Mr. Honey to be of the second — third century A. D., and is of the type used in the latest incinerations. Its provenance is unknown. It would thus seem that the Buckley bowl if, as we believe, it was made in China, was none the less influenced by »Roman» tradition, and if we accept this we are, we believe, in a position to suggest a date for the specimen. To sum up:

The period of the ribbed glass bowls in Egypt is about the first century A. D. and rather later; the vessel shown on Plate XIII, No. 2 is from the Near East and is dated to the second—third century A. D. The date doubtfully suggested for the Buckley bowl by its late owner was T'ang, but we hold that it may well be earlier, for if the whorls on it are related to such Near Eastern examples as we have figured, then it seems to us that the bowl is more likely to be of late Han or early post-Han date than of the seventh to tenth centuries A. D.<sup>66</sup>)

#### MISCELLANEOUS OBJECTS, INCLUDING »PEKING» GLASS

Besides the beads and small objects we have described, there are a number of others of unusual character illustrated on Plate VII.

Nos. 6, a, b, c, are small moulded Buddhist figures, with specific gravities of 5.49, 5.75 and 5.60, respectively. They contain much lead but no barium, and are essentially lead-sodium-calcium silicates with a moderate amount of copper and iron. Bishop White is inclined to attribute them to the period between the Han and Wei dynasties.

No. 8 is a yellow oblate bead of transparent glass, in the Royal Ontario Museum. The corrosion, although not very great, seems to follow an irregular swirled design which had originally occupied the surface.

No. 9 (S. 326) is an unusual zoned bead (we have seen no others like it from China), with a body of deep brownish-black glass, of specific gravity 3.63, and three very slightly raised bands of white glass; it is essentially a lead-sodium-calcium-barium silicate, and on account of its barium content we regard it as of Han date or earlier.

Nos. 10 a and 10 b are surface and median views of an all-glass stratified eye-bead from Persia, with a specific gravity of 2.46. Although resembling many of the glass eye-beads from Egypt and Europe, subtle differences in quality make us doubt whether it was made in the same workshops as those from which were produced the examples of this well-known type of »Mediterranean» bead already described and illustrated in this paper.

<sup>66</sup>) Mr. Honey kindly allows us to record his opinion that the bowl is of a more recent date. His conclusions will be published in the *Burlington Magazine*.

No. 12 represents an object of unknown use. A number were exhibited at the Courtauld Institute in 1934, of which many are now in the Royal Ontario Museum of Archaeology. We have not examined any of these, but figure an example as a stimulus to other investigators.

No. 13 is a thin, smoothly ground disk of transparent red glass closely resembling the best carnelian. Both surfaces are covered with irregular white striae. Its specific gravity is 2.49. We dare not suggest a definite date, but it seems improbable that it is older than T'ang and it may be more recent.

Another unusual bead, for which we can suggest no date, is represented as No. 11 of Plate VII. It is a flattened sphere, nearly 3 cm. across, of greenish glass with a tapered bore hole, ornamented with random swirled threads of greyish-white and greyish-green glass. This bead has been made by the wire-drawn or combed method. The coloured glass was probably applied round the bead, and while still plastic was drawn by a wire to produce the pattern. The body of the bead and its ornamented surface give substantially the same spectrograms, apart from a trace of barium in the surface layers, absent in the body, and the presence in the latter of a medium quantity of tin which occurs only in trace in the surface. It is essentially a sodium-potassium-calcium-lead-tin silicate, with minor quantities of copper, iron, etc. Specific gravity 2.45.

Present day Chinese glass, to judge from the few samples examined, may or may not contain lead. Objects of typical »Peking glass» (made at Po Shan in Shantung but worked at Peking), for instance a large blue flask some 35 cm. high, and also trivial and minor articles of adornment such as the fish (Plate VII, No. 2) and the pendant of which part is illustrated on Plate VII (No. 1), do not contain lead, nor does the greenish yellow, slightly gadrooned saucer (Plate XIV, No. 1) with a much perished surface, which has tentatively been considered as pre-Ming. On the other hand, a fragment of white translucent glass from Po Shan, for which we are indebted to Dr. Carl Schuster, certainly contains a moderate amount of lead,<sup>67)</sup> as does the small floral ornament, green in colour (Plate VII, No. 3), bought in Peking, and the blue dish (Plate XIV, No. 2) of unknown date but provisionally attributed to the seventeenth century. Moreover, although we have had no opportunity of examining such specimens chemically, the weight of a considerable number of glass objects, cups, vases etc., often coloured or presenting cameo effects, attributed to the eighteenth century, suggests that they too contain lead.

It will be remembered that of Han or pre-Han objects, and probably of T'ang objects, some contain lead and some do not. That both kinds of glass are made in China at the present day may well indicate a direct continuity with early times.

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<sup>67)</sup> Other constituents are sodium: and silicon in large amounts, a moderate amount of calcium and aluminium, and some lead; minor constituents are strontium (substantial trace), with traces of potassium, magnesium, copper, iron, and faint traces of barium and tin.

## BARIUM AS AN INDICATOR OF ORIGIN AND AGE

We have stated on p. 22 that we are for the time prepared to accept the presence of barium in glass in quantities exceeding a trace as evidence of Far Eastern origin and of a date not later than Han. To a limited extent we have used its presence to determine the date of specimens illustrated in this paper. We first thought of the piece of sword furniture, Fig. 11 as an archaizing specimen of Sung date; but the presence of barium in considerable quantities leads us to attribute it to the earlier period. As already stated, bead No. 9 of Plate VII (S. 326) is unlike any other bead that we have seen from China, and its barium content points to a Han or pre-Han date. The most interesting example of such dating is offered by the small polychrome convex plaque, of unknown origin, No. 3 of Plate IX (B.

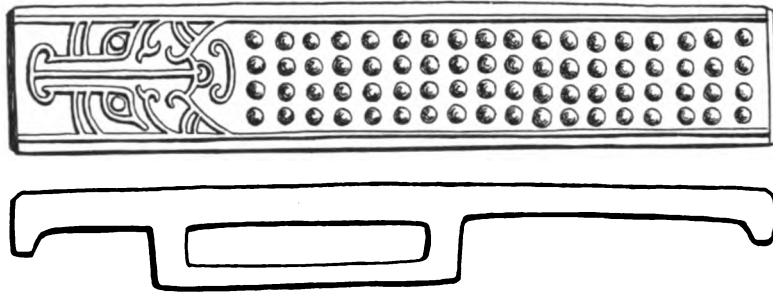


Fig. 11. Glass sword furniture of Han date. (Table III).

2542). This had long been in the Beck collection, where it was not attributed to the Far East; when, however, such specimens as Nos. 4 and 5 came to hand, it was obvious that its Chinese origin would have to be considered, and when Dr. Ritchie's spectrographic analysis (Table IV) gave a result T/M for barium it seemed that the specimen might, until evidence to the contrary was produced, be attributed to the Far East. This attribution is confirmed by its specific gravity of 2.58, which is near that of the plaque (No. 4 of Plate IX) collected by Bishop White in China, sp. gr. 2.35.

The cognate question, how far are barium and strontium present in glass other than Far Eastern, may be considered. By itself, the material at our disposal is too small to be more than suggestive, but as already stated on p. 8 we have failed to find records of barium in analyses of ancient western glass, and this is borne out by its comparative rarity even in traces in Dr. Ritchie's analyses of Near Eastern glass. These show that barium is never present in more than a trace, and even that is not frequent. In the comparative material gathered together in Table I, 21 specimens in all, a trace of barium occurs twice, and the footnote records its presence in the inlay of one of the beads, from the body of which it is absent. Strontium is more frequent, a trace being present in 11 objects. Of other specimens a doubtful trace was noted in the bead from Qau in Upper Egypt though not recorded

in the table on page 10, and a large eye-bead from Egypt of unknown date, coloured deep blue with cobalt, contains traces of both barium and strontium. Again, strontium is present in traces (in two instances T?) in a series of 16 Anglo-Saxon beads from Lakenheath in Suffolk, though only 3 of these beads contain a trace of barium. The wide distribution of strontium in the specimens we have examined is somewhat surprising, since as Professor Cullis informs us it is a scarcer and less widely distributed element than barium or lithium, the latter being very widespread. As already noted, strontium is often associated with barium. Professor Cullis points out that it also occurs as the sulphate, celestite, in fossil saline residues with gypsum, as at Yate in Gloucestershire, or with native sulphur in addition, as at Girgenti in Sicily.

The above results bear out our conclusion that although barium may be present in beads other than of Chinese origin it is not present in such beads in larger amounts than a trace.

### SUMMARY AND SPECULATIONS

An attempt to summarize our conclusions might, we think, take some such form as the following. We know that the great trans-Asiatic highway linking Europe and China was not organized throughout its length until the second century B. C., but long before this Europe had indirectly been in contact with the Far East by a hand to hand trade across the steppe, probably in part along the future trade route. Early in our era, glass vessels of western make were reaching the Far East, but centuries before this — c. 300 B. C. or earlier — two entirely differently ornamented types of western beads were reaching China in sufficient numbers to be admired and to be copied on a considerable scale, though such copying was not servile and the foreign elements might be considerably modified. Both types of bead were common in Europe at the beginning of the Late Iron Age, say 500—400 B. C., but apart from differences in style, not always very definite, the Chinese examples can be distinguished from their western prototypes by the presence in the former of a considerable amount of barium, an element that in beads of western origin is only found occasionally as a trace.

So far we have dealt with facts, but these facts suggest much wider implications. We know that the socketed celt was carried from Europe to China, and that with it passed the European bird-chariot on wheels to become the »dove-chariot» of the Chinese. It might have been possible to show in the first place that the European bird-chariot became the dove-chariot, and only later to discover that with it travelled the infinitely more important socketed celt, indeed something of the sort actually happened. It was only after one of us had concluded that the Chinese dove-chariot and socketed celt owed their origin to Europe, whence they reached China across Siberia, that he learnt that Laufer had already

shown that the Chinese dove-chariot was of European origin,<sup>68</sup>) without, however, reference to the socketed celt.

It is admitted that in the early part of the Han dynasty swords and halberds were of bronze; later, about the beginning of our era, the Chinese were fighting with long iron swords, while among Chinese scholars there is the general belief that iron was known and used in agriculture as early as the fourth or fifth century B. C. The time-lag ceases to be astonishing when the length of the sword of the posterior Han dynasty is taken into consideration. The length, including the handle, of two specimens in the Seligman Collection is about 85 cm. and 102 cm. respectively. It must have been far more difficult to forge reliable weapons of this length than the shorter stouter tools demanded by agriculture.

We shall not then be unprepared to find the story of the bird-chariot and the socketed celt repeated *mutatis mutandis* at a later date. We believe that with the transit of La Tène beads from Europe across Siberia to the Far East there passed also the knowledge and the products of an enormously more important invention, and that we may regard the western beads we have described as entering China on the wave of culture that gave China iron. If this be so, we may well conclude our paper by suggesting that just as *Ex oriente lux* is the key to much of European archaeology, so it will be necessary for modern research to consider whether for China of a later date than middle Chou *Ex occidente lux* may not prove equally true.

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<sup>68</sup>) B. Laufer, "The Bird Chariot in China and Europe", in the *Boas Anniversary Volume* (New York, 1906).



TABLE I. COMPARATIVE MATERIAL, NEAR EASTERN AND MISCELLANEOUS, ALL AGES, GLASS.<sup>1)</sup>

SPECIMEN	Sp. gr.	Li	Na	K	Ca	Ba	Sr	Pb	Sn	Ag	Cu	Zn	Mg	Fe	Cr	Mn	Al	Si	V	Ti	B	P	As	Sb	Ni	Co
Ur, compound eye-bead, blue-green body, (B. 1860), 1.7 <sup>1)</sup> ..	2.29 T	M			M	O	O	T		T	T	O	T	T	T		T	L	T	O	T	O	O	T	O	O
Europe or Near East, compound eye-bead, blue-green body, (B. 2578), 1.6 .....	2.35 T	M			M	O	T	T		T	T	O	T	T	T		T	L	T	T	T	O	O	T	O	O
Constantinople, eye-bead, blue, (B. 2035), 1.1 .....	2.42 T	M			T	O	T	T		O	T	—	T	T	T	T/M	T	L	—	O	T	—	—	O	T	T
Eye-bead, blue, found in China, (S. 569), 1.2 .....	2.23 T	M			T	O	T	O		O	T/M	—	T/M	T	T		T	L	—	O	T	—	—	O	T	T
Luristan, bead, c 1000 B.C., (S.38)	2.49 ?	M			T	M	O	T		T	T	—	T	T	T		T	L	T	O	T/M	T	—	T	O	O
Samarra, fragment, thick glass, (B. M.) .....	2.51 T	M			T	M	O	T		O	O	—	T	T	T		T	L	T	O	T	O	—	O	T	O
Samarra, fragment of iridescent flask, (B. M.) .....	2.31 T	M			T	M	O	T		O	O	—	T	T	T		T	L	T	T	T	O	—	O	T	T?
Egypt, 11th—12th cent <sup>y</sup> A.D. (V. & A. 477/17) .....	3.24 T	M			O	T	O	T	M/L	M	T	O	T	T	T		T	L	T	T	T	O	O	O	T	O
Syria, 14th cent <sup>y</sup> A.D. (V. & A. 1244/21) .....	—	T	M	T/M	T	O	T	T		O	T	O	T	T	T		T	L	T	O	T	O	O	O	O	O
Egypt, mosque lamp, 14th cent <sup>y</sup> A.D. (V. & A. 393/14/1900) .....	—	T	M	T/M	T	O	T	O		O	T	O	T/M	T	T		T	L	T	T	T	O	O	O	O	O
Egypt or Syria, flask, 5th—8th cent <sup>y</sup> A.D., found in China, (T., N.B. 4101), III. 1 .....	—	T	T/M	O	M	O	O	O		O	T	O	T	T	O	O?	T	L	T	O	O	O	O	O	O	O
Egypt or Syria, flask, 5th—8th cent <sup>y</sup> A.D., found in China, (T., N.B. 4102) .....	—	T	M	T	T/M	O	T	O		O	T	O	T/M	T/M	T	O?	O?	L	T	O	T	O?	O	O	O	T
*Arab <sup>s</sup> twist, with blue line, found in China, (T) .....	2.52 T	M			T	M	O	T		T	T	O	T	T	T	O?	T	L	T	O	O	O	O	O	O	O
*Arab <sup>s</sup> twist, found in China (T)	2.86 T	M			O	M	O	O		O	T	O	T/M	T/M	T	O?	T	L	T	O	O	O	O	O	O	O
Cumae, triangular bead, (B, Fig.1)	2.34 T	M			O?	T/M	O	O?		O	T	T	T	T/M	T		T	L	T	T	T	O	O	O	O	O
Lion: Egyptian (B), IV.6 E. ....	2.08 T	T/M			O	T/M	O	T		T	T	O	T	T	O	O	T/M	L	O	O	O	O	O	O	O	O
* Persian (B), IV.6 P. ....	2.15 T	T/M			O	T/M	O	T		T	T/M	O	T	T	O		T	L	O	O	O	O	O	O	O	O
* Chinese (T), IV.6 C. ....	2.17 T	T/M			O	T/M	O	T		T/M	O	O	T	T	O		T	L	T	T	O	O	O	O	O	O
Biconical bead, blue, found at Loyang, (S. 37), IV.5. ....	2.23 ?	T			T	M	O	O		O	T	—	T	T	O	O	T	L	O	O	O	O	O	O	O	O
Rhodes, bead, loop ornament (B. 2566), V.12 .....	3.95 O	T/M			O	M	O	L		T	T/M	T?	T	T/M	T		T	L	T	O	T	O	T	T	T	O
Bead, *Roman*, found in Java (S. 1304), IV.10 .....	2.55 T	M			T	O	O	M		T	T	O	T	T	T		T	L	T	T	T	O	O	O	T	T

<sup>1)</sup> For abbreviations used in first column, see pp. 22—23.<sup>2)</sup> There is a trace of barium in the white and blue inlay of the Ur bead, and in the blue of No. 2578.

TABLE II. CENTRAL ASIA, ANCIENT TRADE ROUTE.

SPECIMEN	Sp. gr	Li	Na	K	Ca	Ba	Sr	Pb	Bi	Sn	Ag	Cu	Zn	Mg	Fe	Cr	Mn	Al	Si	V	Ti	B	P	As	Sb	Ni	Co
Loulan, Turkestan, glass fragment, blue, (Ö. S., K. 11227:55), IV.7 ..	2.45	T	M	T	T/M	O	T	O	O	T	O	T	—	T	T	T	T	T	L	T	T	T	O	—	O	T	O
Loulan, Turkestan, glass fragment, white (Ö. S., K. 11227:294), IV.8..	2.45	T	M	T	T/M	O	T	O	O	O	T	T	—	T	T	T	T	T	L	T	T	T	O	—	O	T?	O
Loulan, Turkestan, beads, *gilt*, (Ö. S., K. 1127:249—250), IV.9 ..	2.17	T	M	T	T/M	O	T	O	O	O	T	T	—	T	T	T	T	T	L	T	O	T	O	—	O	T	O
Kharakhoto region, Mongolia, bead, green, (Ö. S., K. 13710:49), III.3..	2.56	T	M	T	M	O	T	M	O	T/M	T	T	—	T	T	T	T	T	L	T	T	T	O	—	O	T	O
Kharakhoto, Mongolia, bead, blue, (Ö. S., K. 13794:9) .....	2.95	T	T	T/M	T/M	O	T	M/L	T	T/M	T	T	—	T	T	T	T	T	L	T	T	O	O	—	O	T	O
Kharakhoto, Mongolia, bead, white, (Ö. S., K. 13799:103) .....	2.50	T	M	M	T/M	O	T	T	T	O	T	T	—	T	T	T	O	T	L	T	O	O	O	—	O	O	O

TABLE III. PRE-ILIAN OR HAN MATERIAL. (CLASS A, GROUP D).

SPECIMEN	Sp. gr.	Li	Na	K	Ca	Ba	Sr	Pb	Sn	Ag	Cu	Zn	Mg	Fe	Cr	Mn	Al	Si	V	Ti	B	P	As	Sb	Ni	Co
Rod, blue, (T), IV.18.....	3.63	T	M	O	M	M	T	M/L	O	T	T/M	O	T/M	T	O	O	T/M	L	T	O	O	O	O	O	O	O
Plaque, dragon incised, (S. 40), VII.5 .....	3.67	O	M	O	M	M	T	L	T	T	T	T	T	T	T	O	T	M/L	T	O	T	M	T	O	O	O
Sword guard, (S. 17), XV.3b...	3.85	O	M	O	M	M	O	L	O	M	T	O	M	M	O	T	T	M	M	O	O	O	O	O	O	O
Sword furniture, (S. 39), text fig. 11 .....	3.94	O	T/M	O	M	M	T	M/L	O	T	T	O	T	T	O	O	T	L	T	O	O	O	O	O	O	O
Robe hook, (S. 31), VIII.1 (a) red eye* .....	—	O	M	O	M	O	O	O	O	T	M	T	T	T	O	O	O?	L	O	O	O	O	O	O	O	O
(b) green plaque .....	—	O	M	O	M	O	O	M	T	T	M	T	T	M	O	O	T	L	O	O	O	O	T	T	O	O
Robe hook, (S. 32), VIII.2 ..	—	T	T	O	T/M	T/M	O	M	T	T	T	—	T	T	T	O	T	L	T	O	O	T	—	T	O	O
Plaque, green, no inlay, (C), IX.6 .....	—	T	T/M	T	M	T	T	T/M	T/M	T	T/M	T	T/M	T	O	O?	T	L	O	O	O	O	O	O	O	O
Plaque, plano-convex, colourless, (S. 102) .....	5.70	O	L	M	T?	O	O	L	M	M	T	O	O	M	O	O	T?	M	T?	O	O	O	O	O	—	O
Cicada, (O. S. K. 9614) .....	3.75	T	M	O	T/M	M	T	L	T	T	T	—	T	T	T	O	T	L	T	O	O	O	—	O	T?	O
Cicada, (S. 33) .....	4.06	T	M	O	T	M	T	L	O	T	T	O	T	T/M	T	O	T?	L	T	O	O	O	—	O	O	O
Pi, (S. 36), XV.1b* .....	—	T	M	T	M	O	O	T?	T	T	T	T?	T	T	T	T	T	L	T	T	O	O	O	O	O	O
Object of unknown purpose, with dragons in relief, (S. 34), XV.2b .....	—	O	T	T	T/M	O	T?	L	T/M	T	T	O	T	T	O	O	O?	L	T	O	O	O	O	O	O	O
Hexagonal rod, blue (T.) .....	—	T	T	O	T	T/M	T	L	T	T	T/M	T	T	T	T	O	O	M/L	T	O	O	T	T	T	O	O
“ “ violet .....	—	T	T/M	O	T	T/M	T?	M/L	T	T	T/M	O	T	T	T	T	T	O	T	T?	O	T	T	T	O	T?
“ “ white (T.) ..	—	O	T	O	T	T	O	O	O	T	T	O	T/M	T	T	T	T	L	O	O	T	T	O	O	O	O
Capstan bead, dark brown, (T), IV.16 .....	4.9	O	M	O	M	O	O	L	M	M	T	O	T	M	O	O	T?	M	O	O	O	O	O	T	—	O
Bead, green, sub-triangular, (T)	4.29	T	T/M	O	T/M	M	T	L	M	T/M	M	O	T	T/M	T	O	T	L	T	O	O	O	O	T	T?	T?
Melon bead, (T), IV.17 .....	5.10	T	M	O	M	T	O	L	M	T	M	T?	T	T	T	T	T	L	T	T	O	O	O	T	O	O

\* For other examples of cicadas and *pi* see pp. 25—26.

TABLE IV. PRE-HAN OR HAN MATERIAL. (CLASS A, GROUP II).

SPECIMEN	Sp. gr.	Li	Na	K	Ca	Ba	Sr	Pb	Sn	Ag	Cu	Zn	Mg	Fe	Cr	Mn	Al	Si	V	Ti	B	P	As	Sb	Ni	Co
Compound eye-bead, green, (S.114)	3.25	O	L	T	M	M	O	L	M	M	T	O	M	T	O	O	T	M	O?	O	O	O	O	T	—	O
Compound eye-bead, blue, (S. 750)	3.58	T	M	O	M	M	T	L	M	T	T	O	T	T/M	O		T/M	L	O	O	O	O	O	O	T	T
Eye-bead, rectangular, (S. 104), V.11.....	3.42																									
(a) opaque white .....		O	L	O	M	M	M	L	T	M	T	O	M	M	O	O	T	M	T	O	O	T?	O	M	—	O
(b) green .....		O	L	T	M	M	T?	L	T	M	T	O	M	M	O	O	T	M	T	O	O	T?	M	M	—	O
Compound eye-bead, spherical, blue, (S. 109), V.2 .....	3.45	O	L	O	M	M	M	L	M	M	T	O	M	M	M	T	T	M	T?	O	O	O	O	T	—	M
Horned bead, blue, (S. 112), I.12	3.50	O	L	M	M	M	T	L	L	L	T	O	M	M	M	T	T	M	M	O	O	O	O	T	—	M
Compound eye-bead, greenish- white, (S. 515), I.4 .....	3.79	T	M	T	T/M	M	T	L	O	T	T	O	T	T	T	T?	T/M	L	T	O	O	O	O	T	O	O
Compound eye-bead, deep blue, (S. 480), I.13 .....	3.57	T	T/M	O	T/M	M	T	M/L	T/M	T	T	T?	T/M	T/M	O	O	M	L	O	O	T	O	O	T	O	T
Eye-bead, rectangular, red-brown, opaque, (S. 98), II.1.....	3.57	T	T/M	O	T/M	M	T	L	O	T	T/M	O	T/M	T/M	O	O	M	L	O	T	O	O	O	T	O	O
Compound eye-bead, dark blue, (S. 324), V.1. a & b .....	3.50	?	T/M	O	M	M	T	M	T	T	T	—	T	T	O	O	T	L	T	O	T	O	—	O	O	T
Bead, with loop ornament, (S. 219), V.13.....	4.9	T?	T	O	M	M	T	L/M	O	T	T	O	M	T	O	O	T	L	O	T	O	T	O	O	O	O
Plaque, blue, with polychrome in- lay, (C), IX.5 .....	—	T	T/M	O	T/M	M	T	M	T	T	T	T	T/M	T	O	O	T/M	L	T	O	O	O	T	T	T	T
Plaque, blue, with polychrome in- lay, (B. 2542), IX.3 .....	2.58	T	T/M	O	M	T/M	T?	O	T	T	T/M	T	M	T	O	O	M	L	T	O	T	O	T?	T	O	O
*Eye* plaque in silver tubular mount, (S. 41), text fig. 7.....	—	T	M	T?	M	M	O	M	O	T	M	O	T	T	O	T	O	L	O	O	O	O	O	O	O	O
*Eye* crescent, (S. 35), V.15 .....	2.52	T	M	O	M	M	T	T/M	M	T	T/M	O	T	T/M	O	T	M	L	T	O	T	O	O	O	T?	T
*Eye* vessel, (T), III.2 .....	2.66																									
(a) blue green .....		T	T/M	T	M	M	T	M/L	T	T	T/M	O	T	T	T	T	T	L	T	O	O	O	O	O	O	O
(b) white .....		O	T	T?	M	M	T/M	M/L	T	T	T	O	T	T	O	T	T/M	L	T	O	O	O	O	O	O	O

TABLE V. PRE-HAN OR HAN COMPOSITE BEADS (CLASS B).

SPECIMEN	Sp. gr.	Li	Na	K	Ca	Ba	Sr	Pb	Sn	Ag	Cu	Zn	Mg	Fe	Cr	Mn	Al	Si	V	Ti	B	P	As	Sb	Ni	Co
Composite bead, (S. 553), VI.2 .....	2.37																									
Core.....		O	T	T	T/M	M	T	M/L	O	T	T	O	T	T	O	T	T	L	O	O	O	O	O	O	O	O
Surface glaze: white .....		T	T	O	M	M	T	M	T	T	T	O	T/M	T	O	O	T/M	L	T	O	T	O	O	O	O	O
red .....		O	T	O	T/M	M	T	M/L	T	T	T/M	O	T	T/M	O	T	T	L	T	O	T	O	O	O	O	O
cream .....		T	T/M	T	M	M	T	M/L	T	T	T	O	T	T	O	T	T	L	T	O	T	O	O	O	O	O
blue-green .....		O	T	O	M	M	T/M	M	O	T	T	O	T	T	O	O	T	L	T	O	O	O	O	O	O	O
Composite bead, (S. 107) .....	2.81																									
Core.....		O	M	O	M	L	M	M	M	T	T	O	M	L	M	L	T	L	T	O	T?	T	O	O	O	O
Glaze: blue.....		O	M	O	M	L	M	L	M	M	T	O	M	L	T	M	T	L	M	O	T	T	O	T	O	O
white .....		O	M	O	M	L	M	M	T?	T	T	O	M	L	T	M	T	L	O	O	T?	T	O	O	O	O
Composite bead, (S. 18), .....	—																									
Core.....		O	T	O	T/M	T	T	T/M	T	T	T	—	M	T/M	O	O	T/M	L	—	O	T	—	—	O	O	O
Glaze: blue.....		O	T	O	T/M	M	T/M	T/M	T/M	T	M	—	M	T/M	O	T	T/M	L	—	T	T	—	—	O	T?	O
brown .....		T	T	O	T/M	T	T	T/M	T	T	T	—	T/M	T/M	O	O	T	L	—	O	T	—	—	O	O	O
yellow .....		O	T	O	T/M	M	T/M	T/M	T?	O?	T	—	T/M	T/M	O	O	T/M	L	—	T?	O	—	—	O	O	O
Composite bead, (S. 555), IV.1 a, b .....	3.04																									
(a) Core .....		O	L	T?	M	T	O	M	O	T?	T	O	L	M	T	M	T	L	M	M	O	T	O	O	O	O
(b) Vitreous layer.....		O	M	O	M	M	O	L	M	M	T	O	M	M	O	T	T	L	M	T	T?	O	T	M	—	O
(c) Eye .....		O	M	O	M	M	M	L	O	T?	T	O	M	M	T	O	T	L	M	T	T?	T	T	M	—	O
(d) Rings round eye .....		O	M	O	M	O	O	L	T?	M	T	O	M	T	O	O	T	T	T	O	T	O	T	O	—	O
Composite bead, (S. 2). II.7... .....	2.92																									
(a) Core .....		T	M	T	T/M	M	T	T	O	T	T	—	T/M	M	M	T/M	T	L	—	O	T	—	—	O	T?	T?
(b) Surface glaze (green)...		T	M	T	T/M	M	T	M/L	O	T/M	M	—	T/M	T	T/M	T	T/M	L	—	O	T	—	—	O	O	O

TABLE VI. T'ANG PERIOD, GLASS.

SPECIMEN	Sp. gr.	Li	Na	K	Ca	Ba	Sr	Pb	Sn	Ag	Cu	Zn	Mg	Fe	Cr	Mn	Al	Si	V	Ti	B	P	As	Sb	Ni	Co
Hair ornament, (S. 250), XI.1 ..	---	T	M	T/M	M	T	T	O	O	O	T	O	T/M	T	O	O	T/M	L	O	O	O	O	O	O	O	O
Bracelet, (S. 103), XI.2 .....	---	T	M	O	M	T	T	O	O	O	T	O	T	T	O	O	T/M	L	O	O	O	O	O	O	O	O
Glass ornament, perhaps an inlay, (S. 101), XI.3 .....	2.53	O	T	O	M	T	T	T/M	O	T	T	T	T	T/M	O	T	M	L	T?	O	O	O	T?	O	O	O
Small beads, black, yellow, and 4.3- green*, (S. 106) .....	4.5	O	T	O	T/M	O	O	L	O	T	T/M	O	T	T/M	O	T	O?	L	O	O	O	O	O	O	O	O
Bunch of grapes, blue-green, (S. 105), XI.4 .....	2.52	T	M	T/M	M	O	O	T/M	T	O	T/M	O	T	T	O	T	L	T	O	O	O	O	O	O	O	O
Fly on leaf, blue-green, (S. 102), XI.5 .....	2.56	T	M	T	T/M	O	O	T	T	O	T/M	T	T	T	O	O	L	O	O	T	O	O	O	O	O	O
Glaze from T'ang pot, yellow- green, (Mrs. M. Holmes) .....	c. 5	O	T	O	T	O	O	L	O	T/M	T/M	O	T	T	O	T	L	T	O	O	O	O	O	O	O	O
Glaze from T'ang pot, opalescent bluish-white, (S. 12) .....	---	T	M	O	M	T	O	O	O	T	T	O	T/M	T/M	T	T	T/M	L	T	T	T	T	O	O	T	O

\* The analysis given is that of a black bead.

TABLE VII. CHINESE, MODERN, INCLUDING ALL POST-T'ANG SPECIMENS, GLASS.

SPECIMEN	Sp. gr.	Li	Na	K	Ca	Ba	Sr	Pb	Sn	Ag	Cu	Zn	Mg	Fe	Cr	Mn	Al	Si	V	Ti	B	P	As	Sb	Ni	Co
Fish, modern, (S. 53), VII.2 .....	2.53	O	L	M	M	O	O	O	O	M	T	O	M	M	O	O	M	M	M	O	O	O	O	T	O	O
Pendant, modern, (S. 54), VII.1 ..	2.50	O	L	M	M	O	O	O	O	T	T	O	T?	T	O	O	M	M	T	O	O	O	T	O	O	T?
Flower derivative, modern, (S. 52), VII.3 .....	3.19	O	L	M	T	O	O	L	L	M	T	O	O	M	O	O	O	M	O	O	O	O	O	M	O	T
Flask, blue, modern, (S.) .....	---	T	M	T	T/M	T	T	T	T	T	T/M	T	T	T	O	O	T	L	T	O	O	O	O	O	O	T
Bowl, blue, Ming*, (S. 200), XIV.2	---	T	T	T	T	T?	T	M/L	T	T	T/M	T	T	T	O	O?	T	M/L	T	O	T	O	T	O	O	T
Saucer, grey-green, pre-Ming*, (S. 201), XIV.1 .....	---	T	T/M	T/M	T	T	O	O	O	O?	T	O	T	T	O	O	T?	L	T	O	T	O	T	O	O	O
Koware from Suburban Altar, Hang- chow, greenish-white glass**, Sung, (Sir Percival David) .....	2.5	O	L	M	M	O	O	T	O	T?	T	O	M	M	O	M	O?	L	M	T?	T	T	M	O	O	O

\* If Ming, very late, i. e. 17th century.

\*\* Perhaps glaze rather than glass, but the lump examined seems too large and irregular to be a drop of glaze from any *Ko* vessel.

## POSTSCRIPT

Since this was written, Professor Umehara has published *Rakuyo Kinson Kobo Shuei* (Catalogue of Selected Relics from Ancient Tombs of Chintsun, Loyang), in which he illustrates (Pl. L, Fig. 2) a mirror, presumably natural size (in the plate it is about  $12\frac{1}{2}$  cm. across), divided into three zones with a central ornament. The latter consists of a glass plaque about 2 cm. in diameter, having one central, circular, stratified eye, round which are grouped six, less strictly circular, stratified eyes. Then comes an undecorated metal zone, with a diameter, including the central plaque, of 4 cm. Outside this is a circular area, about  $2\frac{1}{2}$  cm. wide, decorated with compound eyes of the usual Chinese type, not spherical but somewhat flattened, between each pair of which are three eccentric stratified eyes, the total number of compound eyes being 12 and of the eccentric eyes 18. All these appear to be inlaid into the bronze back of the mirror. Outside the area decorated with compound eyes, is a zone about  $1\frac{1}{2}$  cm. broad, of a mottled stone material, described as jade. This outer zone is carved into a six start left hand spiral and is held in position by the turned-back edge of the bronze constituting the face of the mirror. The specimen is in the G. L. Winthrop Collection, New York.

The author appears to have no doubt that this magnificent specimen comes from Lo Yang and is of the same age as the other objects that he figures, the majority of which also appear in Bishop White's, *Tombs of Old Lo-yang*. It is, however, to be noted that no mirror with glass inlay of this description appears in the latter work. Our own comment would be on the following lines. We see no reason why the specimen should not be of pre-Han age and of Lo Yang origin; there can in fact be no doubt as to age so far as the glass is concerned, but considering the frequency with which jades foreign to the object in which they are presented to the collector occur, it seems worth considering whether the jade outer circle, which is hardly of the type commonly associated with objects dating from late in the Chou period (Yett's »Third Phase«), may not have been added after the discovery of the mirror. Whether this be so or not, there seems no doubt that this mirror is the finest example known to date of the Chinese workers' skill in applying polychrome glass decoration to metal, exceeding in refinement even the gilded silver inlaid vessel represented on Plate X of our paper.

## APPENDIX

*Japanese and Korean beads from dolmens or burial mounds.*

Having had the opportunity of examining a certain number of beads from Japan and Korea, which certainly antedate 1000 A. D. and are not likely to be later than the 7th—8th century, i. e. corresponding in date to the T'ang period in China, it seems worth while to put our results on record, previously noting that much

glass existed in Japan in the eighth century A. D. Writing of the Shōsō-in collection, which dates back to the eighth century (with a few known exceptions), Professor Jiro Harada informs us that apart from the »Arab« glass alluded to on p. 13 the glass objects include 200 glass tips (blue, brown, yellow, and green) for the rods (*jiku*) on which are rolled sutra scripts, and about 62,500 glass beads, while many glass beads of different colours help to compose the headdresses worn by the Emperor Shomu and his consort. There are also pieces of bead work and lumps of unworked glass. We can hardly suppose that such numerous objects are of western origin. Our own specimens include:

(1) Small yellow, light blue-green, and dark blue beads from a Japanese dolmen, kindly put at our disposal by Mr. R. Kerr of the Royal Scottish Museum, Edinburgh. These beads consist essentially of sodium-calcium-lead silicate. The yellow bead contains a trace of barium but no strontium; the others contain neither of these elements. The yellow bead apparently owes its colour to iron and a trace of copper. Specific gravity varies from 2.08 to 2.27.

(2) A number of beads collected at Keishu in Korea, originating from the neighbouring burial mounds of the Silla dynasty, which lasted from 57 B. C. for nearly 1,000 years (there is, however, no reason to believe that the specimens collected were early Silla). These beads fall into two groups. The first consists of small green, green-blue, semi-opaque, and more or less transparent dark blue beads, with a sp. gr. of about 2.27; the blue and green-blue beads contain a trace of barium but no strontium. The second group consists of larger beads (over 1 cm. in diameter) of blue and deep amber glass; the glass of both colours is full of bubbles, and the amber coloured beads are often faintly ribbed, so that they might be called melon beads. Sp. gr. 2.46 (amber) and 2.49 (blue). These beads contain no barium or strontium, and only a doubtful trace of lead. Both groups are essentially sodium-calcium silicates, with small amounts of colouring oxides.

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## LIST OF PLATES

### PLATE I.\*

All beads on this plate  $\times 2$ , except No. 6 ( $\times 1\frac{1}{2}$ ) and No. 8  
(rather less than  $\times 2$ ).

- No. 1. Glass bead, blue with white eyes; Constantinople. (B. 2035.) T. I.  
» 2. Glass bead, blue with white eyes; China. (S. 569.) T. I.  
» 3. Glass bead, blue with white eyes; Florence. (B. 2266.)  
» 4. Glass bead, with compound eyes; China. (S. 515.) T. IV.  
» 5. Glass bead, with compound eyes; China. (S. 42.)  
» 6. Glass bead, with compound eyes; Europe or Near East. (B. 2578.) T. I.  
» 7. Glass bead, with compound eyes; Ur. (B. 1860.) T. I.  
» 8. Glass bead, with compound eyes; Silchester. (Reading Museum, Sil.  
55. 37.)  
» 9. Glass eye-bead, stratified; China. (S. 16.)  
» 10. Glass eye-bead, stratified; China. (S. 19.)  
» 11. Glass eye-bead, stratified; China. (S. 321.)  
» 12. Glass bead, »horned». (S. 112.) T. IV.  
» 13. Glass bead, with compound eyes; China. (S. 480.) T. IV.  
» 14. Glass bead, »horned», with compound eyes. (Sedgwick Collection.)

### PLATE II.

Nos. 5, 8, 9, 10, 12, 13, c.  $\times 2$ ; Nos. 1, 2, 3, 4, 6, 7, 11, c.  $1\frac{4}{5}$ .

- No. 1. Glass bead, rectangular with stratified eyes. (S. 98.) T. IV.  
» 2. Glass double bead, projecting stratified eyes. (S. 223.)  
» 3. Composite bead, with gold bands in interior. (S. 561.)  
» 4. Composite bead, zone decoration. (S. 187.)  
» 5. Composite bead, polychrome pentagon design. (S. 55.)  
» 6. Composite bead, polychrome, sp. gr. indeterminate. (C [32].)  
» 7. Composite bead. (S. 2.) T. V.  
» 8. Composite bead. (S. 1.)

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\* The ownership, and where it is known the number of the specimen, is shown in parentheses; T, followed by a roman numeral, indicates the table (pages 51 to 56) in which a spectrographic analysis of the specimen is shown. For significance of other abbreviations used, see p. 23.

No. 9. Composite bead with ›approached› eyes. (S. 80.)

- › 10. Glass bead from Cumae. (B. 1616.)
- › 11. Composite bead, red orange core. (S. 550.)
- › 12. Composite bead. (S. 19.)
- › 13. Glass bead, black with white eyes; Sarawak.

### PLATE III.

No. 1 c.  $\times \frac{2}{3}$ ; Nos. 2—4  $\times 2$ ; Nos. 5—6  $\times 3$ .

No. 1. Glass flask; Lo Yang. (T., N. B. 4101.) T. I.

- › 2. Fragment of glass vessel, with compound eye decoration; Lo Yang. (T.) T. IV.
- › 3. Glass bead; near Khara khoto, Edsin gol, Mongolia. (Ö. S., K. 13710: 49.) T. II.
- › 4. Glass bead; China. (T.)
- › 5. Glass bead in form of *uatchet* eye, with stratified ›eyes›; Egypt. (B. M. 79. 5—22. 22.)
- › 6. Glass bead; Egypt. (S. 71.)
- › 7. Glass bead; Java (Mlle Colani, *Megalithes du Haut-Laos*, Paris, 1935, vol. II, *aquarelle* 1, No. 11).

### PLATE IV.

Nos. 6 & 11  $\times \frac{1}{1}$ ; all others  $\times 2$ .

No. 1. Glass bead with stratified eyes; Qau, Egypt. (B. 2198.)

- › 2. Glass bead, with stratified eyes; Qau, Egypt. (B.)
- › 3. Glass bead, with stratified eyes; Lo Yang, China. (T.)
- › 4. Glass bead, with stratified eyes; Lo Yang. (T.)
- › 5. Glass bead (blue), biconical; Lo Yang. (S. 37.) T. I.
- › 6. Glass beads in form of lions; from Egypt, Persia, and China. T. I.
- › 7. Glass fragment (blue); Loulan, Turkestan. (Ö. S., K. 11227: 55.) T. II.
- › 8. Glass fragment (white); Loulan, Turkestan. (Ö. S., K. 11227: 294.) T. II.
- › 9. Glass beads (gilt); Loulan, Turkestan. (Ö. S., K. 11227: 249—250.) T. II.
- › 10. Glass bead; Java. (S. 1304.) T. I.
- › 11. Glass eye-bead; Kelpin, Turkestan. (Stein, *Serindia*, Pl. VI 009a, now in British Museum.)
- › 12. Glass bead; Loulan, Turkestan. (Ö. S., K. 11227: 60.)

No. 13—15. Glass capstan beads; China. (S. 67, 68, 69.)

- » 16. Glass capstan bead; China. (T.) T. III.
- » 17 a and 17 b. Glass melon bead, two views; China. (T.) T. III.
- » 18. Rod of blue glass; Hsin Cheng, Honan, China. (T.) T. III.

#### PLATE V.

All c.  $\times 1\frac{1}{4}$ .

No. 1 a and 1 b. Glass compound-eye bead; China. (S. 324.) T. IV.

- » 2. Glass compound-eye bead; China. (S. 109.) T. IV.
- » 3. Glass compound-eye bead; China. (S. 560.)
- » 4. Glass compound-eye bead; China. (S. 516.)
- » 5. Glass compound-eye bead; China. (S. 750.)
- » 6. Glass compound-eye bead; China. (S. 347.)
- » 7. Glass compound-eye bead, with low projecting eyes; China. (S. 347.)
- » 8. Glass compound-eye bead, with elaborate ornament; China. (S. 157.)
- » 9. Glass compound-eye bead; China. (S. 558.)
- » 10. Glass bead with stratified eyes; China. (C. 33/2.)
- » 11. Glass eye-bead, rectangular; China. (S. 104.) T. IV.
- » 12. Glass bead, with loop design; Rhodes. (B. 2566.) T. I.
- » 13. Glass bead, with loop design; China. (S. 219.) T. IV.
- » 14. Glass bead, with loop design; China. (C. 32/275.)
- » 15. Glass »eye« crescent; China. (S. 35.) T. IV.

#### PLATE VI.

Nos. 1—7  $\times 1\frac{1}{2}$ ; Nos. 8 and 9  $\times 5$ .

No. 1. Composite eye-bead, brown core: (a) external surface, (b) median section; China. (S. 555.) T. V.

- » 2. Composite bead, polychrome with hard grey core; China. (S. 553.) T. V.
- » 3. Composite bead, with spiral design; China. (S. 89.)
- » 4. Composite eye-bead, with glass faience core; China. (S. 1.)
- » 5. Composite eye-bead; China. (S. 80.)
- » 6. Composite eye-bead, with simple impressed eyes; China. (S. 85.)
- » 7. Composite bead, roughly made, soft core; China. (S. 4.)
- » 8. Glass eye-bead, with stratified eyes, surface and median section; Qau, Egypt. (B. 2198.)
- » 9. Composite eye-bead, surface and median section; China. (S. 1.)

PLATE VII.

Nos. 1—3  $\times \frac{1}{2}$  No. 4  $\times \frac{1}{1}$ ; No. 5  $\times \frac{4}{5}$ ; Nos. 6 and 11  $\times 1\frac{1}{4}$ ; Nos. 7—10  $\times \frac{1}{1}$ ;  
Nos. 12 and 13 c.  $\times \frac{1}{1}$ ; No. 14  $\times \frac{5}{8}$  (?).

- No. 1. Glass pendant, China, modern. (S. 54.) T. VII.  
 » 2. Glass fish, China, modern. (S. 53.) T. VII.  
 » 3. Glass, China, modern. (S. 52.) T. VII.  
 » 4. Bird, friable red pottery, with white, brown, and blue glazes; China, late Chou period. (Mr. George Eumorfopoulos.)  
 » 5. Glass plaque, dragon incised; China. (S. 40.) T. III.  
 » 6. a, b, c. Three Buddhist figurines; China. (T.)  
 » 7. Glass cylinder bead, with chevrons; China. (T.)  
 » 8. Glass bead, yellow, with whorl decoration; China. (T.)  
 » 9. Glass bead, brown with three white circles; China. (S. 326.)  
 » 10. a and b. Glass bead, showing surface and median section; Persia. (B.)  
 » 11. Glass bead, with whorl decoration; China. (S. 65.)  
 » 12. Glass object, of unknown use; China. (T.)  
 » 13. Glass, flat red annular disk, resembling carnelian; China.  
 » 14. a and b. Clay object, two views; Mayen, Rhineland. c. 700 B. C.

PLATE VIII.

All  $\times \frac{4}{5}$ .

- No. 1. Robe hook, with green and red glass inlays. (S. 31.) T. III.  
 » 2. Robe hook, with remains of glass stratified eye inlay. (S. 32.) T. III.  
 » 3. Robe hook, with three glass plaques with stratified eyes. (C. P.)

PLATE IX.

No. 1  $\times$  c.  $\frac{3}{4}$ ; No. 2  $\times \frac{1}{1}$ (?); Nos. 3—6  $\times 2$ .

- No. 1. Red pottery bowl, with white slip and compound eye ornamentation in coloured glazes. (Sedgwick Collection.)  
 » 2. Glass plaque in bronze mount. (T., N. B. 2452.)  
 » 3. Glass plaque, with polychrome inlay. (B. 2542.) T. IV.  
 » 4. Glass plaque with polychrome inlay. (T.)  
 » 5. Glass plaque, with polychrome inlay. (C.) T. IV.  
 » 6. Glass plaque, no inlay. (C.) T. III.

PLATE X.

No. 1 a  $\times$  c.  $\frac{1}{3}$ ; 1 b slightly enlarged.

- No. 1. a. Bronze wine vessel, partially gilt, inlaid with silver with areas of applied glass plaques consisting of multiple eye designs. (Stoclet Collection.)
- › 1. b. Part of same.

PLATE XI.

All  $\times \frac{1}{1}$ .

- No. 1. Glass hair ornament. (S. 250.) T. VI.
- › 2. Glass bracelet. (S. 103.) T. VI.
  - › 3. Glass ornament, perhaps an inlay (S. 101.) T. VI.
  - › 4. Glass, conventional grape design. (S. 105.) T. VI.
  - › 5. Glass fly, on leaf. (S. 102.) T. VI.

PLATE XII.

The Buckley bowl (V and A. c. 680—1936), two views; both rather less than half size.

PLATE XIII.

No. 1  $\times \frac{1}{1}$ ; No. 2 rather less than half size.

- No. 1. Roman bowl, view of outer surface, showing pontil mark and whorls. (B. 652.)
- › 2. Roman cinerary vessel, showing grooved whorls. (V. and A. 5217/1901.)

PLATE XIV.

Both c.  $\times \frac{2}{3}$ .

- No. 1. Base of glass saucer; greenish glass, shallow gadroons; Chinese. (S. 20.) T. VII.
- › 2. Base of glass bowl, blue; Chinese, perhaps seventeenth century. (S. 200.) T. VII.

PLATE XV.

Glass and jade parallels.

No. 1. a and b. Jade and glass *pi*. (S. 36.) T. III.

» 2. a and b. Jade and glass objects of unknown purpose, with dragons in relief. (S. 34.) T. III.

» 3. a and b. Jade and glass sword guards. (S. 17.) T. III.

PLATE XVI.

No. 1 c.  $\times \frac{2}{3}$ , No. 2  $\times \frac{1}{1}$ ; No. 3  $\times \frac{1}{1}$ .

Above, Grave group, early La Tène, from St. Remy-sous-Bussy (Marne), showing compound eye-bead.

Below, La Tène beads from Bussy-le-Chateau; blue and white eye-beads and compound eye-bead.

Below and to right, Blue and white eye-bead from the Meare lake-village, Glastonbury.









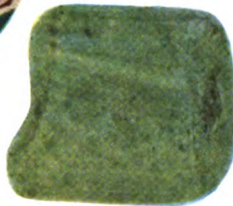




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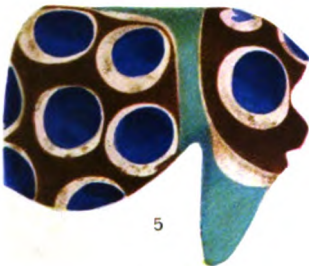
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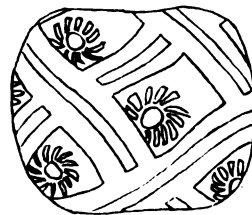
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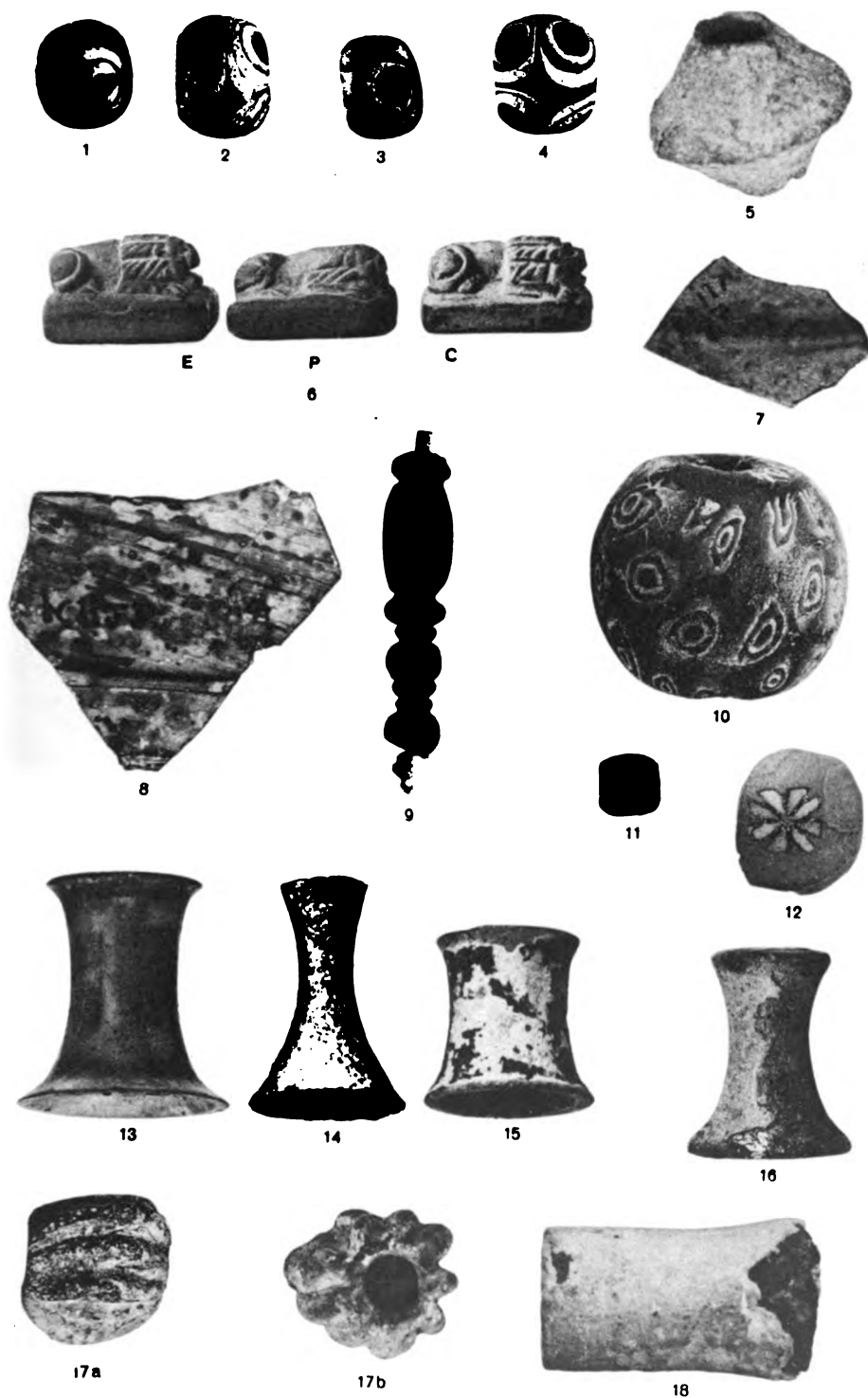


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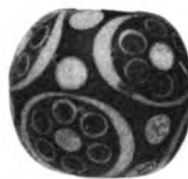




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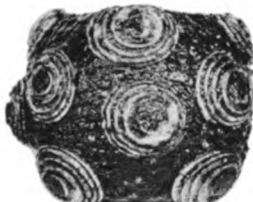
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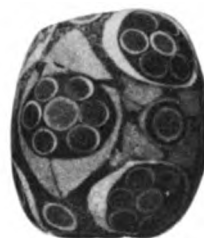
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1a



1b



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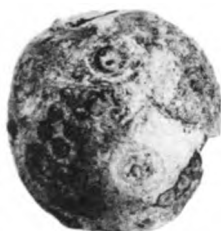
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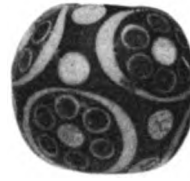




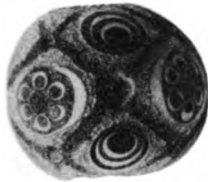
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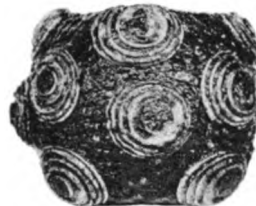
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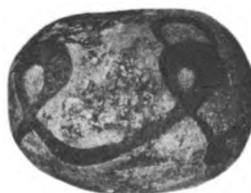
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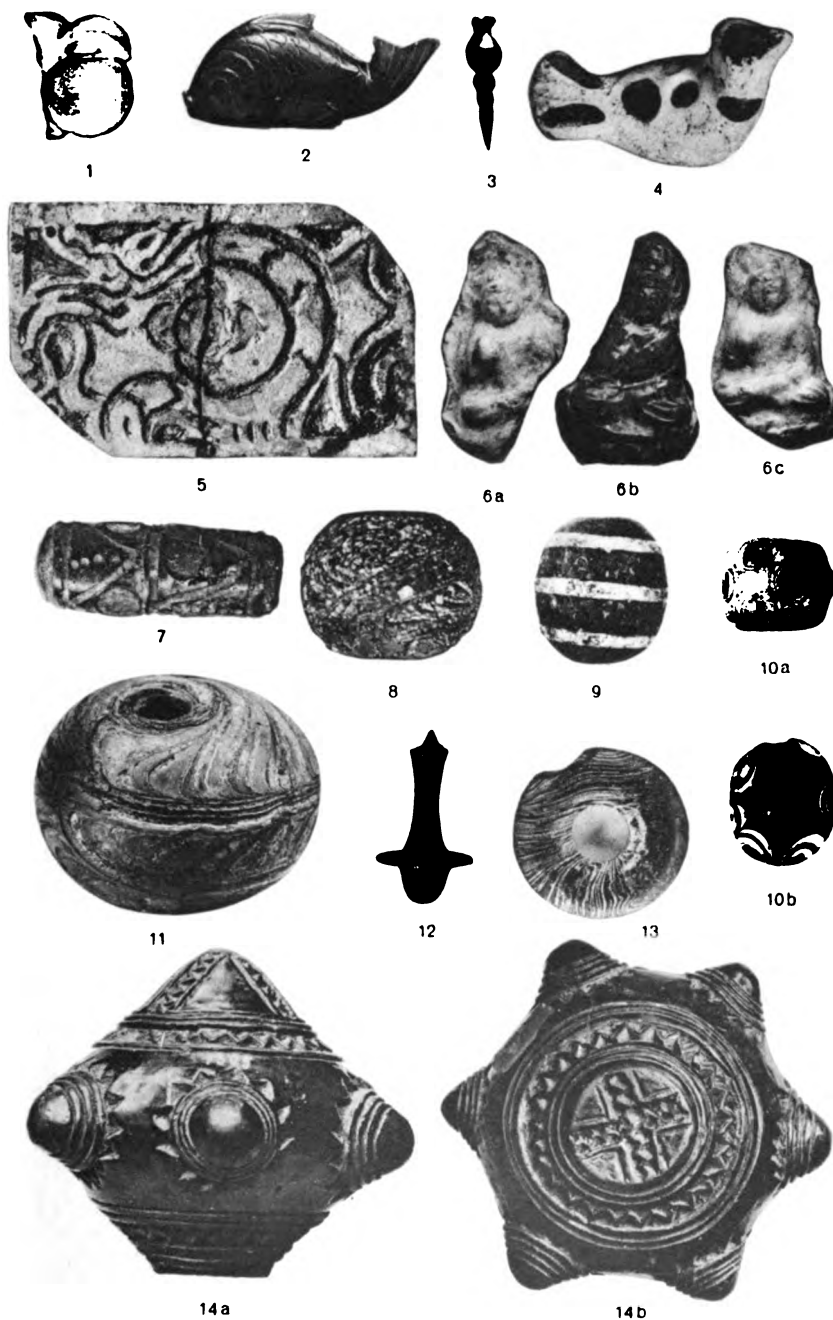


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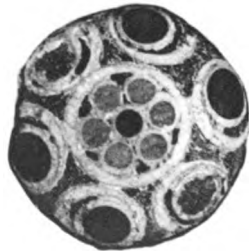
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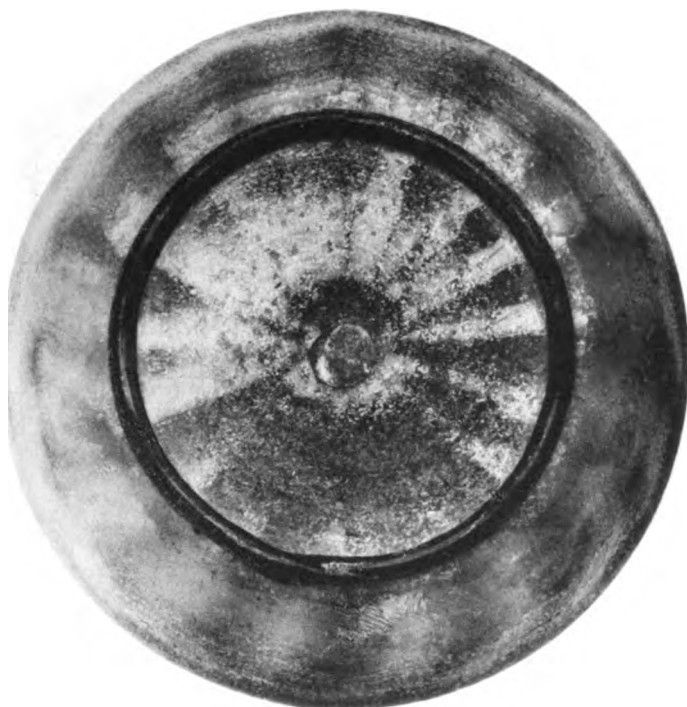


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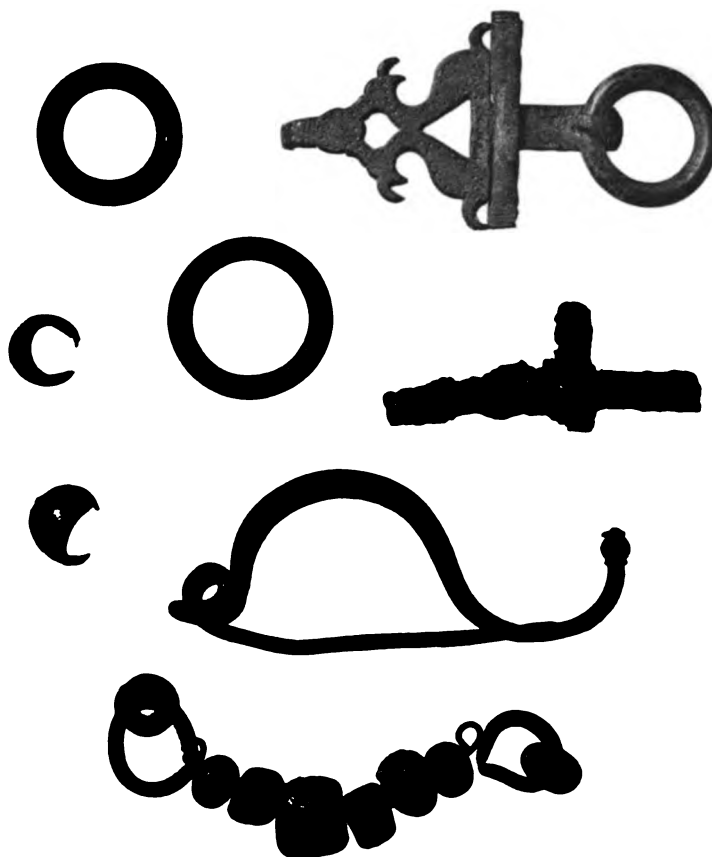
3a



3b







St Remy.sous.Bussy  
(Marne.)  
Sépulture gauloise 5.  
Début de la Tène 1.  
67839.





GREEN  
GLASS

LOYANG  
R.U.  
QAU

WHITE  
GLASS

LOYANG  
R.U.  
QAU

BLUE  
GLASS

LOYANG  
R.U.  
QAU

↑↑  
CALCIUM

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AN ↑↑  
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# NOTES ON A KIN-TS'UN ALBUM

BY

BERNHARD KARLGREN

The publication of extensive materials in a garb of satisfactory photographs is a vital interest to archaeology, and in the field of Chinese archaeology none has rendered such eminent services of this kind as has Professor S. Umehara. His *magnum opus* *Shina kodō seikwa* is an indispensable aid to every scholar in the field; and its successful publication in seven big folio volumes has not exhausted the energy of our Japanese colleague: the last few years have witnessed the appearance of three more important albums from his hand: the mirror album *L'étude sur le miroir antérieur à la dynastie des Han*, 1935; the album of bronzes from late Chou times *Etude des bronzes des royaumes combattants*, 1936, and then, again, in 1937, the beautiful album *Rakuyō Kinson kobo shūei* (Collection of the best specimens from the ancient tombs of Lo-yang). It is a large quarto volume with 58 pages of text, and 94+10 plates.

When in 1934 Bishop W. C. White published his *Tombs of Old Lo-yang*, the work created a real sensation in sinological circles. With admirable patience and tact the author, sitting in K'ai-feng-fu, had managed to keep in constant touch with the art dealers who handled the materials that resulted from the plundering of the Lo-yang tombs, and to sift the evidence reaching him through the most diverse channels as to the disposition of the graves and the objects excavated. The danger of building upon hearsay and secondary or tertiary evidence was obvious, and the subsequent analysis of his publication has shown that a certain number of objects accepted by him as being of Kin-ts'un provenience cannot very well derive from these graves. On the whole, however, it must be said that Bishop White rendered sinology a signal service by his careful and painstaking work; he certainly did the best that could be done in the circumstances, and we have every reason to be grateful to him for his courage in publishing what information he was able to gather to the best of his ability about these finds, which are of paramount importance to archaeology.

There were, however, certain drawbacks connected with this first great Kin-ts'un publication. On the one hand, the reproductions were, in many cases, somewhat poor; on the other hand, it was evident and well-known to many scholars and collectors that a good many Kin-ts'un objects had escaped the cognizance of Bishop White and had been thrown on to the international market without his having a chance to incorporate them in his great album. From the very outset, therefore, there was a strong feeling that a new Kin-ts'un publication was badly needed as a complement to White's book, and one that was better illustrated. Professor

Umehara has evidently desired to supply this much-felt want, and the result of his endeavours is the present album.

In regard to the reproductions it is certainly a great improvement on White's pictures. Umehara's plates are generally of excellent quality and therefore highly instructive.

As to the plan of the work and its execution, there are various points to which I should like to draw attention.

### THE PROVENIENCE QUESTION.

Of the objects reproduced by Umehara only a minority were treated by White, the rest being objects belonging to various collectors in Japan, Europe and America,<sup>1</sup> which are here brought together as forming the furniture of the Kin-ts'un tombs. The reader is extremely eager to hear the evidence given as to their Kin-ts'un provenience, and he peruses Umehara's text (all in Japanese, with no summary in any Western language) with great expectations. He is, however, disappointed. After a first short introductory chapter, the author has a second chapter called »the disposition and construction of the old graves«, but this is only a summary of White's description, and gives nothing new. And the third chapter: »The excavated objects and their whereabouts« seems to promise us the information desired, but it gives nothing but a few vague statements. We are told that the objects were not regularly excavated but plundered, that a good many came into the hands of Bishop White and through him to the Toronto Museum, but that the great majority, and among them many of the most important items, in various ways »were scattered all over the world and are now in the possession of museums and private collectors in various places«; that the first collector to lay hands on Kin-ts'un objects was Jörg Trübner, and that Marquis Hosokawa bought a good many during the years 1930—34; and that specimens are to be found in the collections of Mr. Winthrop, New York, the Freer Gallery of Art, Washington, the Museum of Fine Arts, Boston, the Nelson Art Gallery, Kansas City, Mrs. Christian Holmes, New York, Mr. C. T. Loo and Mr. David Weill, Paris, Mr. Stoclet, Brussels, the British Museum, Museum für Völkerkunde, Berlin, »some Swedish collectors«, Mr. Kano (Hakuzuru Art Gallery), Mikage, Mr. Moriya, Kyoto, the Imperial Household Museum, Tokyo. That is all this chapter contains; and some more names of collectors are furnished on the plates: Academy of Oriental Culture, Kyoto Institute, coll. Gutman, Berlin, University Museum, Kyoto, Mr. Bidwell, Springfield, Messrs. Yamanaka and Co., New York, Mr. Worch, Paris, Mr. Asano, Osaka, the Art Institute of Chicago, Baron Sumitomo, Osaka, Mr. Ohta, Kyoto.

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<sup>1</sup>) None in China, except the Piao bells, which belonged to the Shanghai collector Liu T'i-ch'f before they were recently brought to Japan.

All this is somewhat disappointing. In regard to White's material we know, at least, that a shrewd observer, well versed in the Chinese language, perfectly acquainted with the mentality of Chinese art dealers, and living in a place a fairly short distance to the East of the graves all the time the actual plundering was taking place, had checked, to the best of his ability, the provenience of the objects he published. Umehara, on the contrary, has no single word of documentation, showing why all these extremely heterogeneous objects: ritual and other bronzes, silver objects, lacquer works, statues, mirrors, jades, dress-hooks etc. should have come from the Kin-ts'un tombs. We have to take his word for it. In other words, the author is no better placed, in this respect, than anybody else; he has no inside information; like every Western dealer or collector he has had to rely on the word of the Chinese dealer who happens to declare that such and such an object »comes from Kin-ts'un».

This little sigh of disappointment does not mean that we consider it entirely futile to collect the information available from Chinese art dealers as to which objects may be stated, with a fair amount of probability, to come from Kin-ts'un. On the contrary, since we have nothing better to go on, we have to seize upon such meagre documentation as we can obtain and try to check it by means of stylistic criteria. On the whole, it might be possible, by careful sifting, to prepare a useful list of objects that might have a serious claim to have come from Kin-ts'un, a list that would be correct in nine cases out of ten. Though not comparable with real excavation documentation, it might still have a considerable value. But if Umehara's book is to be regarded in this light, we have to consider more closely his principles of selection.

#### THE SELECTION OF OBJECTS TREATED.

The obvious desiderata are two: Firstly, a really complete list — quite apart from the illustrations — of all objects that we may reasonably assume to have come from Kin-ts'un. Secondly, plates of all the important pieces out of this list, which have not been published, or not satisfactorily published, before.

Neither of these desiderata has been realized in Umehara's album. In the first place, he gives no list at all of any objects beyond those which he reproduces. If Umehara, who has an astounding personal knowledge of all collections in various countries — more so perhaps than any other living scholar — had tried systematically to compile an exhaustive Kin-ts'un inventory (in the sense just stated: based on the information of comparatively reliable art dealers), as a complement to White's book, he would have rendered sinology a considerable service. Now, he records sometimes quite insignificant items, but he passes over in silence a great many highly important pieces. To the collectors he mentions many more could easily be added, e. g. Countess de Béhague, Paris, Madame Ramet, Paris, Madame Homber, Paris, the Cleveland Museum of Art, and so on. It is curious that

Umehara mentions only in passing some »Swedish collectors», but does not illustrate a single specimen from that source. Thanks to Professor Andersson's fundamental paper *The Goldsmith in Ancient China* (BMFEA 7) it should be well known that many important Kin-ts'un specimens are to be found in the Museum of Far Eastern Antiquities, Stockholm, and in the collections belonging to H. R. H. the Crown Prince of Sweden, Mr. A. Hellström and Mr. A. Lundgren.

In the second place, Umehara's choice of objects for illustration is not determined by any desire to publish mainly such specimens as have not been reproduced before or not satisfactorily reproduced. The reader will find that a great many objects excellently published by Umehara himself in his earlier albums recur here. Indeed, about one third of his plates are mere repetitions from his earlier publications. In fact, he expressly tells us (p. 9) that his principle of selection has been to reproduce only »the more important specimens». But he has not been able to carry through this principle. He has sometimes reproduced objects that do not tell us very much but missed various specimens of great importance, well known to be from Kin-ts'un and yet never published before his own album appeared. Of the latter I shall only adduce three examples.

One is the exquisite dragon, inlaid with gold, which was one of the most admired jewels of the private exhibition of Mr. C. T. Loo's in London in the autumn of 1935, in connection with the great Chinese art exhibition. Its great scientific importance was already pointed out in the *Maandblad* of July 1934, by Visser. It was acquired by the Museum of Far Eastern Antiquities in 1935. I refrain from reproducing it here, since Visser has published it in an illustrated article in the *Maandblad* of April 1937.

My second example is a Hu owned by Mr. C. T. Loo, Paris. I reproduce it here (Pl. I), and I add a drawn representation of its décor scheme (Pl. IV). The Hu has a height of 12.5 cm. Through pressure the vessel has become slightly deformed, the top and bottom rims forming irregular ovals. Greatest diameter at mouth 4.8 cm., at bottom 5.6 cm. Two rings form handles, each attached to the nose of a t'ao-t'-ie mask. These masks and rings, though probably ancient, may not have belonged to this vessel originally. They are of poor quality, in strong contrast to the excellent workmanship of the Hu itself. They cover in a very clumsy way part of the silver-inlaid pattern, which seems to indicate that they have been added afterwards. They are gilt, not hammered with gold. It is not even certain that these rings were originally associated with these masks, since the colour of their gilding is different.

A shelf, 0.7 cm. down on the inside of the rim, indicates the position of the missing lid. This inside of the rim, as well as the top of it, is covered with hammered gold.

Horizontal zones about 0.7 cm. broad, at the rim, the neck, the belly and the narrowing part just above the foot ring, as well as this ring itself, are covered with thin gold plate.



The fields between these horizontal rings are filled with a *décor* inlaid with silver. For the most part the silver forms the pattern, though this is sometimes fashioned by the bronze bottom being spared out. The bronze is everywhere covered with a rich deep-brown, often reddish, patina, with green patches. The silver has been laid on in threads, which have been flattened out, when hammered into the shallow depressions, so as to become strips about 0.1 cm. broad. The long loops are formed by from one up to seven parallel strips. These have been hammered so tightly together that in the best preserved places they give an impression of being sheets of silver. Observe that what is still a regular dragon in the second zone has been dissolved, in the third zone, into a mere spiral.

My third example is a handle consisting of six combined animals (Pl. II). It belongs to Mr. C. T. Loo, Paris. Height 9.5 cm. The handle has evidently been applied with the bird in an upright and the tiger in a vertical position, over the outward-bending rim of some vessel, possibly a bowl. Inlaid with gold, nearly everywhere in threads, only in the ears and on the breast in small sheets. The bird grips a snake in its up-turned claws and has buried the head of the snake in its throat, its powerful beak closing over the back of the snake. An excrescence in the middle of the snake's body might indicate rudimentary feet; it may therefore be a question of a dragon-snake. The bird is a fabulous bird, for it has ears and horns, the latter pressed closely to the head, passing backwards and down in a curve behind and below the ear and springing forward to a bold point just beneath the eye. The tiger grips the bird with its front paws just below the wings and bites the leg of the bird. Its nose is turned up like a kind of horn. Its tail is raised in a bold curve, so that its tip touches the tiger on the back, thus forming a loop. This loop is made to serve as body and legs of another animal, the head, with nose and horn, roughly indicated, being fancifully added on top of the tiger's tail. The backward-pointing tuft on the tiger's hind leg is formed into a comma-shaped figure, which has the result that if the tiger is inverted, this tuft appears as a bird's head, the rump and shank of the tiger being the breast and the feathers of the bird. Similarly the tuft on the front leg and the shoulder form another bird's head.

These three examples will suffice to show that Umehara has sometimes missed quite fine Kin-ts'un specimens. Sometimes, moreover, his informations about the objects described is not quite accurate. The unique mirror (App. Pl. VIII) with three animals, two of which have pear-shaped spots, a mirror which I have discussed extensively in my article *New Studies on Chinese Bronzes* (BMFEA 9), is indicated as belonging to Mr. Winthrop. At the time of the publication of Umehara's album it was still owned by Mr. C. T. Loo; now it belongs to the Museum of Far Eastern Antiquities as a gift from Mr. Loo.

## THE DESCRIPTIONS.

The main part of Umehara's text (pp. 9—52) contains a descriptive commentary on the objects depicted. It sometimes contains quite important facts which cannot be gleaned from the photos, and for the benefit of students who do not read Japanese I shall quote some of the data that refer to specimens in Japanese collections, beyond the reach of most Western students.

Pl. III. Bell in the Imperial Household Museum, Tokyo. On the inside, just under the handle, there is a half-ring, for fastening a tongue. The bell is decorated on both the outside and the inside. This bell has been the subject of a special article by Umehara in *Bijutsu Kenkyū*, no. 44.

Pl. XIII. Bronze Lei, Hakuzuru Art Gallery, Mikage. Height 6.5 Jap. inches. Inlaid with gold and silver. It is heavily covered with incrustations, but in the zones between the raised bands one can discern »hill-shaped and spiral-shaped patterns, derived from dissolved animals».

Pl. XVI. Lacquered Hu, belonging to the same collection. Height 9.3 Jap. inches. The core is of wood; it is covered with thick black lacquer. On the rim and the foot are applied bands; painting has been added in two zones, one below the rim band, one on the belly. The painting is in red and »one more colour», and the pattern is reproduced in a drawing on p. 19, fig. 9:1.

Pl. XVIII. Lien, toilet box, in black lacquer, belonging to the same collection. Height with lid 5.7 Jap. inches, diameter 4.7 inches. Umehara says that in the Hakuzuru Gallery it is held that the core is of leather, but he believes it to be made of fibre stuff.

Pl. XIX. Lacquered Lien, toilet box, belonging to the same collection. Diameter 7.6 Jap. inches. Wooden core. On lid gold inlay in the shape of a quatrefoil. The sides between the bands have been painted, but the pattern is entirely destroyed by decay.

Pl. XX, XXI. Boxes (repr. natural size) belonging to the same collection. Wooden core with black lacquer, and with inlaid quatrefoils. The boxes had fared so badly that it was impossible to determine what they had contained. Umehara suggests that the oblong box may have had some connection with an interesting small object inlaid with gold and silver, reproduced on p. 20, fig. 10, and identified by him as a writing-brush handle.

Pl. XXII. Hu belonging to the same collection. Pottery, covered with black lacquer. Height 9.3 Jap. inches. Painted in red in a volute and triangle pattern, reproduced on p. 19, fig. 9:2. Umehara mentions that, together with this vessel, there were brought to Japan several fragments with wooden core but with the same kind of lacquer and a similar décor in red: a handle, a tiger foot, a clasp with tiger head etc.

Pl. XXIII. Silver cup belonging to Marquis Hosokawa, Tokyo, reproduced in natural size. Both on the exterior and the interior of the rim, on the handles

and in the interior bottom there is gilding. In the cavities under the handles there are traces of lacquer, showing that the cup has rested on lacquered wooden supports.

Pl. XLIV. Mirror belonging to the same collection. Diameter 6 Jap. inches. The bottom and pattern are painted in alternate red and white, and some of the colour is undoubtedly ancient, though in many places it has been touched up since excavation.

Pl. LVII. The curious objects on this plate, belonging to the Yamanaka Co., Osaka, consists of two parts.

The upper part is the long bronze pole to the left, divided into sections (in order to imitate bamboo?); its top is formed by an animal's head, with the mouth shaped so as to show that it was meant to receive (to bite over) some object. The head is attached by means of a hinge, so that it is movable. The lower end is formed into a narrower peg.

The lower part consists of: first, a short tube, in three »sections«, into which the above-mentioned peg fits; secondly, three rods, attached by means of hinges to the tube, and terminating in animals' paws at the lower end; two of these rods are still in position, the third has been detached. The whole of this »tripod« apparatus is small and slender: the left part of the plate gives it in  $\frac{3}{5}$  scale. Umehara tells us that it is covered with an exquisite inlay décor in gold and silver, in extremely fine lines, much resembling that of the famous inlaid tube from Lo-lang belonging to the Art School of Tokyo, but the décor is largely covered with incrustation, and the photo reveals nothing of it to the reader.

App. Pl. V. Hu belonging to Mr. Asano, Osaka. Height 1 foot 6 inches (Jap.). On the lid there are three animals, the details of which are brought out by gold inlay. Lid, body and foot are inlaid with white and green glass and with gold rivets and silver inlay, in patterns that are not clearly visible in the photo, but which have been carefully drawn on p. 17 of the text, fig. 8. The top section of that drawing represents the pattern on the bands dividing the vessel into zones, the second section reproduces the big surfaces, the third section the foot, and the fourth the pattern on the lid.

If Umehara sometimes thus gives us valuable information in his text, the reader is hardly ever satisfied in a case like this; ungratefully he generally clamours for more. It stands to reason that when the author has to treat such a great number of objects in a few pages, the descriptions are mostly but a few summary hints. That is sufficient in the case of specimens that are brought out quite clearly by the photos, e. g. various ritual vessels, mirrors, jades. But it is less satisfactory in regard to two large groups of objects.

On the one hand, the features of specimens inlaid with gold, silver, turquoise, glass or various other substances are seldom satisfactorily brought out by the photos alone. Since gold and silver look just the same in a photo, a beautiful

pattern in alternating gold and silver lines and surfaces is entirely lost to the spectator, once it is turned into an uncoloured photograph. Therefore the reproduction of inlaid objects should be accompanied, either by a minute description (such as Umehara seldom gives), or, still better, by a drawing indicating clearly the material of the various parts. Professor Andersson has very successfully worked with the latter method in his article *The Goldsmith in Ancient China*, and I give here some more examples. Pl. IV gives the pattern of the Hu belonging to Mr. C. T. Loo (Pl. I) discussed above. Pl. V presents two inlaid finials.

One of them (our Pl. V:1), one of a pair having formerly belonged to Mr. C. T. Loo, now in the David Weill collection, Paris, is reproduced by Umehara Pl. LXII, in which one can see practically nothing of its *décor*; it has already been depicted in his *Shina kodō seikwa* III:48. Its height is 7.7 cm., diameter at the base 2.9 cm. The silver band round the lower part is slightly concave, with holes for a fastening spike. It is inlaid with gold (grey in the drawing) and silver (white in the drawing), also on the capped end (gold). The silver and gold are cut out in sheets and hammered into shallow depressions.

The other finial belongs to the Museum of Far Eastern Antiquities, and is reproduced in our Pl. II. Its drawn pattern recurs in our Pl. V:2. Height 6.2 cm., diameter at the base 3.3 cm., the technique the same as in the preceding.

In our Pl. VI:1 we have one of the handles in Umehara Pl. LXII, formerly belonging to Mr. C. T. Loo, now in the Weill collection. Breadth (minus the fastening tongues) 9 cm., height 6.7 cm. The handle is not a curved cylinder, for though round on the inside, it is flanged out into two sharp rims on the outside, and bridging over those two rims is laid a silver band. The latter can hardly have been fastened merely by being hammered into position; in all likelihood it must have been soldered on to the bronze. The inlay in gold and silver has been applied in sheets.

In the same plate, our Pl. VI:2, I have given the drawn *décor* of some other highly interesting specimens. There is an apparatus reproduced by Umehara in his Pl. LXVI, a compound specimen often published before, and called a »frame for a loom» in the catalogue of the great London exhibition, but cautiously defined as »a bronze object of curious shape» by Umehara. To this apparatus are attached two pairs of handles. One pair, oblong, has been fastened in a vertical position, the other pair, somewhat ear-flap shaped, of a kind that may have served as finials on an armchair or such-like, has been attached protruding at either end. These two pairs of handles have a most wonderful inlay *décor* in gold and silver, and their beauty and importance have never been sufficiently brought out by the photos published so far. They represent the very highest standard of inlay technique and are priceless specimens. I give them here in drawn reproductions in Pl. VI.

On the other hand, there is another class of objects for which a photo and

a few words of summary description do not suffice. These are various specimens which do not turn a flat or at least fairly large surface to the camera, objects *en ronde bosse*, dress-hooks, finials, complicated jade carvings etc. There are some of Umehara's specimens that are tantalizing, photos just sufficient to hint at highly interesting objects but unsupported by a really detailed description and therefore riddles rather than documents. In regard to this category of objects it is valuable when an author is very explicit. Even in cases where he gives two or more photos of one specimen, from different sides and angles, we may still need a supplementary commentary. I shall give a single example of this. There are, among the Kin-ts'un finds, a number of finials consisting of dragon's heads combined with birds of prey; they fall into three closely related groups.

One of them was first illustrated by Professor Kümmel in Jörg Trübner zum Gedächtnis, 1930, Taf. 47. His description is short but to the point and instructive. Umehara reproduces the same finials (Pl. LXI), indicating E. Worch, Paris, as owner; they have now passed into the possession of the Cleveland Museum of Art, Cleveland, Ohio. Mr. Stoclet, Brussels, owns another pairs, practically identical.

The second group is represented by the finials in the Hakuzuru Art Gallery, Mikage, Umehara Pl. LVIII. LIX.

The third group, highly reminiscent of the first, but differing from it in several important respects, is represented by several specimens. White has illustrated one pair (his Pl. LXXII, poor plate), and Umehara (Pl. LX) gives a pair belonging to the Hakuzuru Art Gallery — this seems to be the same specimens as those published by White. Secondly Mr. C. T. Loo possessed another pair, Umehara Pl. LXII (already in his *Shina kodō seikwa* III:48), now belonging to Mr. David Weill. This latter I have reproduced here (our Pl. III). Of course, in comparing the photos in White, Umehara and the present article it is possible to form an approximate idea of the construction of the finials. Nevertheless, even the most attentive reader is non-plussed in regard to several important elements, and he can have no idea of the finer details of the technique, nor of the materials used. This is a typical case in which a supplementary commentary is indispensable, and as an example of what I consider to be a matter of principle I shall add here such a commentary to my Pl. III.

The finial has a height of 12.5 cm., diameter at the base 2.8 cm. The principal part is a dragon's head. An eagle gripping the upper jaw from beneath, behind the front teeth, bites the upper lip, its tail resting under the lower jaw. The eagle is inlaid with silver sheets, a pattern being created by openings where the bronze comes through: in the middle of the tail a T shaped double volute, above that a row of dots, on the neck a rope pattern formed by bronze and silver threads alternating. Here, as elsewhere on this bronze, the dots are not due to the bronze's having risen through the openings as a consequence of chemical change, but they are real studs rising from the bronze bottom, as

shown in places where the inlay has fallen out. The nostrils of the dragon are spiral-shaped and inlaid with silver threads in rope pattern. Apart from the big front teeth, the other teeth are summarily suggested by a low ledge, hammered with silver sheets. The eyes are made of an elevated ring and a stud of bronze, and the whites of the eyes are inlaid silver. The eyebrows, passing in a bold curve directly into the ear, are formed by two parallel raised lines of bronze, with a band of silver inlaid between. The ridge of the nose is marked by a tuft, inlaid with silver, and taking a shape which closely resembles the bird's tail under the lower jaw. Behind the lower jaw, the jaw curve has taken the shape of a spiral, formed by inlaid silver threads. The lips and corner of the mouth are marked by a raised ridge. This and the surfaces on the dragon's head as well as the big ears are inlaid with gold, in sheets, perforated at regular intervals by bronze studs coming through and making a dot pattern, or by spirals, the pattern being here in some cases spared out. Two long curved horns, streaked with inlaid silver threads, perforate the ears.

The lower part of the finial is covered with two symmetrically placed dragons. Each dragon bites on a branch (?). Its body is inlaid with bands of gold. From the tip of the tail to the hind legs these bands cover the body entirely, yet with bronze studs (dots) coming through, and ending in a volute and triangle pattern spared out in the inlay so as to fit in with the rump and the hind legs. Of the front legs, one is hidden behind the branch. The body, from the middle of which rise wings, has, from the hind legs to the neck, a broad length-wise opening in the inlay, where the bronze comes through, and in the middle of this, again, there is a narrow inlaid band of silver. The tails of the two dragons are bound together by a transverse strip — a very typical Huai style feature.

The branches rise from a ring of silver, entirely covering the lowest part of the finial. In this are inserted five »whorl circles» (of a modified Huai type), made by openings in the silver ring and with the lines inlaid in gold. The whole finial is a marvel of workmanship, and Kümmel's words about the Cleveland Museum finials (*loc. cit.*) are equally true here: »Keine Beschreibung und keine Abbildung vermag von der funkelnden Pracht dieses Juwels eine Vorstellung zu geben».

#### THE DATING.

The dating of the furniture from the Kin-ts'un tombs has been a subject of much discussion. Umehara devotes his last short chapter to this theme. He starts from the inscription of the Piao bells, and reminds us that most Chinese scholars (followed by myself) consider that the »22nd year» mentioned in the inscription means the 22nd year of Ling wang of Chou, i. e. 550 B. C., but that Kuo Mo-jo maintains that it means the 22nd year of An wang of Chou, i. e. 380 B. C. (Umehara erroneously says 379 B. C.). He does not mention

a third theory advanced by Wen T'ing-king, to the effect that it means the 22nd year of Wei-lie wang of Chou, i. e. 404 B. C. Without entering upon any philological examination, Umehara shortly states that for stylistic reasons he inclines rather to a later than to an earlier date. Now, this is arguing in a circle: we determine styles typologically, and then, by means of dated specimens, we fix an historical chronology for these styles. If we have, at the outset, a conventional and undocumented idea that the Huai style (»so-called Ts'in style») reigned only in the 4th and 3rd centuries B. C., and if we then find specimens in Huai style, the date of which is probably 550 B. C., we should not say: it cannot be so early, the date must be wrong, since we have always imagined this style to be several centuries later. We should, on the contrary, conclude: our earlier theory, that the Huai style is but little anterior to the Han dynasty, is wrong, since we find it fully developed in a specimen dating in all likelihood in 550 B. C. It is really not necessary to insist on this point, since we have attested the Huai style in a whole series of vessels which cannot be later than the 6th century and the early decades of the 5th century B. C. (see Karlgren, BMFEA 8, p. 151; cf. also Yetts in *Burl. Mag.* 1937, where he gives vessels in splendid Huai style, reliably dated by him in the early 5th century). As to the Piao bell inscription, I have reverted to this theme in BMFEA 9, p. 104, and confirmed my earlier opinion, based on that of a whole group of prominent Chinese archaeologists, that the date is really 550 B. C. Kuo Mo-jo's date 380 is entirely out of the question; the date 404, supported, among others, by Jung Keng, is more possible, yet for various reasons very unlikely. The date 550 is, indeed, practically certain.

From the Piao bells Umehara passes on to a date giving a lower limit, and we are amazed to find it fixed as late as 210 B. C. Indeed, in the introduction to his *Etude sur le miroir antérieur à la dynastie des Han*, p. 14, Umehara *en passant* stated that objects dated in 210 B. C. had been found in the Kin-ts'un graves, and I was extremely astonished, but since no more information was vouchsafed there I had to wait for further news. We obtain it here: on Pl. XXIX Umehara depicts two small silver stands (reproduced in natural scale), belonging to the University Museum, Kyoto, one of which has an incised inscription containing the words »in the 37th year». Umehara tells us that he and Mr. Mizuno together have determined this »from the style of the script and for other reasons» to mean the 37th year of Ts'in Shih-huang-ti, i. e. 210 B. C., the last year of the reign of China's great unifier, the first Ts'in emperor.

I am afraid that this fundamentally important question cannot be solved so quickly and easily; it is indeed a very intricate problem and demands a much more thorough investigation.

Let us start at another end, and make an inventory of the principal specimens with inscriptions, stated to have come from the Kin-ts'un graves. We have already mentioned the Piao bells and their date 550 B. C. There is

another vessel with a long cast inscription, the Hu in Umehara Pl. IV, White Pl. CXIV, in fully developed Huai style. It is mostly known as the Si-tsī Hu, and has been extensively studied by Kuo Mo-jo in his *Ku tai ming k'o huei k'ao*. It is true that this inscription contains no names or facts which could give an exact date. But the type of the script is quite telling. It is decidedly not from late Chou time (4th or 3rd centuries B. C.) but comparatively early: it is rather earlier than later than the hand of the Piao bell inscription. Indeed it shows no great advance on the script of the second part of Western Chou (ending in 771 B. C.). Thus for instance, for *kün* prince cf. San shī p'an, for *kia* 'house' cf. Sung hu, for *shu* (either in the sense of 'pure', or loan for 'uncle') cf. K'o ting, for *wo* 'I, my' cf. Hu ling, for *t'un* (in the sense of *ch'un* 'pure') cf. Shan fu K'o ting, for *yüe* 'moon' cf. Sung kuei etc. One or two details might suggest a somewhat more advanced stage: *k'ang* 'vigorous' agrees closely with the graph on the several centuries later Ch'en Man Fu of Ts'i. But on the whole it has very little of the flavour of the »late Chou« script. From a palaeographic point of view, therefore, I estimate that this inscription can hardly be dated later than 600 B. C., which tallies well with the fact that the vessel stylistically stands very close to several of the Sin-cheng bronzes.

Besides these vessels with long cast inscriptions there is quite a number with incised inscriptions.

A. In Umehara's album Pl. VIII we have a square Hu, belonging to Kyoto Institute, Academy of Oriental Culture, with an incised inscription on the foot (same vessel and inscr. White Pl. CX).

B. The silver cup Umehara Pl. XXIII (Hosokawa coll.) has two characters on the bottom, which Umehara (p. 23) reads as *kan hiao* »sweet — filial piety« which is decidedly wrong; the second character is not *hiao* but *yu*, and the sense of the phrase is obscure.

C. The silver cup Umehara Pl. XXIV (Hosokawa coll.) has incised on it a long inscription, reproduced on p. 22, fig. 11:1,

D. The silver cup Umehara Pl. XXV:1 (Hosokawa coll.) has the same incised characters as B above.

E. The box of silver gilt Umehara Pl. XXVIII (Mrs. Chr. Holmes coll.) has on the bottom the incised inscription reproduced on p. 22, fig. 11:2, 3.

F. The silver statuette Umehara Pl. XXX:1 (Winthrop coll.) has the incised inscription reproduced on p. 25, fig. 14:2.

G. The silver statuette Umehara Pl. XXX:2 (Hosokawa coll.) has the incised inscription reproduced on p. 25, fig. 14:1.

H. The lid of a silver box White no. 259 has the incised inscription shown in White Pl. CLXXXVII:7.

I. The Ting tripod White no. 232 b has the incised inscription *ibid.* 8.

K. The Ting tripod White no. 232 a has the incised inscription *ibid.* 9.

L. The fragment of a P'an White no. 243 has the incised inscription *ibid.* 11.



M. The pedestal lamp White no. 113 has the incised inscription *ibid.* 12.

N. The pedestal lamp White no. 109 has the incised inscription *ibid.* 13.

Most of these incised inscriptions are not decipherable, yet many of them contain indications of measure, and some of them are clearly cognate, having peculiar graphs and phrases in common, for instance: A and C; B and C, D, F; C and E, F, G. The last of them, N, is peculiarly interesting, since it reads: *Han kün* »the prince of Han<sup>2</sup>» — the same Han<sup>2</sup> which occurs in the Piao bell inscription, the Han<sup>2</sup> state which was one of the heirs to the old state of Tsin, and the dignitaries (princes?) of which are undoubtedly buried in the Kin-ts'un tombs.

The script type of all these incised inscriptions is quite homogeneous and allows of an approximate dating.

In the first place it is decidedly anterior to the normalizing unification of the script reform carried through by Ts'in Shihuang-ti and his famous minister Li Si, which resulted in the script form known as *siao chuan* »small seal», the script codified in the dictionary *Shuo wen kie ts'i*. The earliest examples of this normalized script are on the one hand the well-known long inscription on weights and measures, relating how the emperor, after having united the whole realm in 221 B. C., established norms for weights and measures<sup>1</sup>, and, on the other hand, the T'ai-shan inscription<sup>2</sup>. Our incised inscriptions have little or nothing in common with that script type.

It should be added that we know of a good many incised inscriptions on early Han vessels, in the same tenor as to the wording as our Kin-ts'un inscriptions: indications of measure and weight etc. But the graphs in these early Han inscriptions, though sometimes clumsily and carelessly scratched and therefore slightly deformed, always go back to *siao chuan* prototypes, i. e. are derived from the normalized small seal of Li Si's, and are therefore in principle different from our Kin-ts'un inscriptions. See the numerous examples in Jung Keng: *Ts'in Han kin wen lu*.

In the second place the Kin-ts'un incised inscriptions have no connection with the Ts'in script anterior to Li Si's normalization. It has often been stated that Li Si's reform created no new script type, and that it only meant that the Ts'in script which had existed for centuries, was made authoritative and obligatory. This is not quite true. The *siao chuan* »small seal» is certainly closely connected with the earlier Ts'in script, most of its characters are quite unaltered, but a good many others are simplified or modified, and the reform was really a normalization. This we can easily verify, for we know many examples of earlier Ts'in script. Particularly important in this respect are the *Chu Ch'u wen* »Imprecations

<sup>1</sup>) For a translation see Chavannes, *Mém. Hist.* II, p. 549. Rubbings of such inscriptions abound, see *ibid.* and BMFEA I, p. 35, and most of the Chinese bronze repertories, esp. Jung Keng: *Ts'in Han kin wen lu*.

<sup>2</sup>) See Chavannes *Mém. Hist.* II, p. 553, with reproductions.

against Ch'u» of king Huei-wen's time (337—311 B. C. )<sup>1</sup>, and the famous s. c. Chou stone drums<sup>2</sup>. The essential point here is that our incised inscriptions from Kin-ts'un under discussion are not in Ts'in script.

So far the negative side of the question. The positive is this: we know a considerable number of incised bronze inscriptions which, in regard to the type of the graphs and their technical execution, are closely cognate with our Kin-ts'un inscriptions. Some of the most famous ones have been discovered in recent years. Such are, for instance, the inscriptions of king Hiung Han of Ch'u, i. e. Yu wang (237—228 B. C.)<sup>3</sup>, and the inscription on the famous Hu of the Museum of Penn, Philadelphia<sup>4</sup>, a Ts'i inscription in all probability dated 279 B. C. Incised inscriptions are quite common on weapons<sup>5</sup>, but they also occur on a fair number of ritual vessels. If we choose some examples from an easily accessible repertory, Lo Chen-yü's Cheng sung t'ang tsi ku i wen, we find such inscriptions in: Küan 2:9 (Ting), 2:30 (Ting), 2:38 (Ting), *ibid.* (Ting), 2:48 (Ting), 6:24 (Fu), 7:25 (Hu), 7:27 (Hu), Sü shang 20 (Ting), 24 (Ting), Pu yi shang 4 (Ting), 36 (Hu). Lo Chen-yü tells us that he considers them to belong to the Warring states' period (roughly 450—221 B. C.), and there is every reason to believe that he is justified in this opinion. In fact, none of them gives any names of states or places or princes (princesses) that could date them earlier. Their wording is mostly quite different from that of the ordinary inscriptions of the feudal courts in the Ch'un ts'iu period (722—481 B. C.), of which we possess a great number (cf. BMFEA 8). In short, both their tenor, their graphs and the technique of their script clearly indicate that they are later than the inscriptions of the Ch'un ts'iu period<sup>6</sup>.

Since the kingdom of Han<sup>2</sup>, mentioned on the Piao bells, recurs in one of the incised Kin-ts'un inscriptions, since the graves are placed not very far from the Han<sup>2</sup> capital (Huai-k'ing-fu), and hence their connection with the Han<sup>2</sup> kingdom is quite certain, since this kingdom was destroyed in 230 B. C., since the incised inscriptions are undoubtedly anterior to the normalization of the script under Ts'in Shih-huang-ti (221—210 B. C.), and since they cannot very well be anterior to  $\pm$  450 B. C., as just stated, we are in a position to state

<sup>1</sup>) See Chavannes *loc. cit.* p. 544.

<sup>2</sup>) Cf. Ma Heng: Shih ku wei Ts'in k'o shih k'ao, 1931.

<sup>3</sup>) See Liu Tsie: Ch'u k'i t'u shih, or Kuo Mo-jo: Liang Chou kin wen ts'i ta hi t'u lu.

<sup>4</sup>) See BMFEA 7, Andersson p. 26, and Kuo Mo-jo *loc. cit.*

<sup>5</sup>) Lo Chen-yü: Cheng sung t'ang tsi ku i wen, 12:7, 8, gives two *ki* lances with long incised inscriptions which contain the same character Han<sup>2</sup>, state name, which occurs in the Piao bell inscription and in the incised inscription N above.

<sup>6</sup>) An apparent exception is the famous Ts'in kung Kuei (early 6th century, see Karlgren BMFEA 8, p. 71, nr C 176), which, besides a long cast inscription typical of its date, has incised inscriptions with indications of measure on the lid and the sides of the foot, see Lo Chen-yü *op. cit.* 6:15. But Lo, following Wang Kuo-wei, shows that these have been added in Han time.

that these incised inscriptions are Han<sup>2</sup> inscriptions belonging to a period roughly determinable at 450—230 B. C.

In the preceding demonstration I have purposely left out of consideration the silver stands with the incised inscription which Umehara would date in the 37th year of Ts'in Shih-huang-ti (210 B. C.), and we must now revert to this question. In the first place it must be observed that the stands are entirely plain, with no décor whatever which could connect them stylistically with the Kin-ts'un finds; thus there is always the risk that they do not really belong to this find. Umehara tells us, however, that reports have it that they were collected together with the silver boxes Pl. XXVII and XXVIII, which have two of the incised inscription just discussed, and thus there is at least a probability that they really do derive from Kin-ts'un. The question now is this: are the inscriptions of the silver stands *different* from the incised inscriptions which we have just determined as being of Warring States' time, in so far as they reveal the normalized script of Ts'in Shih-huang-ti's and Li Si's? This they should undoubtedly do, if they were cut in the emperor's last year (210 B. C.) and with a date expressly referring to his reign. A definite answer to this question can only be given after a detailed examination of the inscriptions. Unfortunately they are very brief and give but few clues. They run thus:

1st line: *er shih ts'i nien kung yu shih . . . chung pa liang shih er*

2nd line: *nien chung shih si mei (?) chung . . .*

3rd line: four unreadable characters.

In the 1st line there is no character which clearly indicates *pre* or *post* normalization. They are all well known from Chou inscriptions as well as from Han inscriptions, with the exceptions of *chung* 'heavy', occurring also in the 2nd line; the form of this word, however, is closely cognate with the graph forming the phonetic of *chung* 'bell' in the famous Lü bell inscription (anterior to 340 B. C., see BMFEA 8, p. 64). Thus the 1st line gives no safe *point d'appui*. In the 2nd line there are two characters which might seem to belong to the normalized script: *chung* 'middle' and *si* 'four'. The former, *siao chuan* fashion, has no »pennants» on the vertical stroke, as it should have in Chou script; but this is not decisive, for the same truncated form occurs already in the earlier inscription E above (Umehara p. 22, fig. 11:3). More interesting is the form for *si* 'four'. In Chou script generally and in the incised inscriptions discussed above it is written with four horizontal strokes. Here, on the silver stand, 2nd line, it crops up in the regular *siao chuan* (normalized small seal) form: an oblong ring with two vertical strokes inside; I suppose this is what has decided Umehara's and Mizuno's opinion. Yet another form, not quite identical but very similar: an oblong ring with two vertical strokes and one horizontal stroke inside, already occurs in the same Lü bell inscription (anterior to 340 B. C.), and this shows that already long before the end of the Chou dynasty one had sometimes deviated from the orthodox graph for 'four' (the four horizontal

strokes) and initiated the prototype of the *siao chuan* graph for the word. Here, again, we can arrive at no reliable decision. Finally, the 3rd line has four undecipherable characters, entirely aberrant from the normalized small seal, and strongly reminiscent of the incised graphs of the Warring States' period.

The outcome of this investigation is the following. There is nothing in the silver stand inscriptions definitely pointing to a normalized *siao chuan* script. On the contrary, there are positive features connecting them with the other incised inscriptions discussed above. These latter are most decidedly anterior to the normalization under Ts'in Shih-huang-ti, and they have nothing to do with the Ts'in script even anterior to the normalization. It is certain therefore that the »37th year« does<sup>not</sup> mean the 37th year of Ts'in Shih-huang-ti's reign (210 B. C.).

What, then, does it mean? The Kin-ts'un graves, where certainly Han<sup>2</sup> dignitaries (princes) were buried, lie very close to Royal Chou. The dating should therefore reasonably refer, either to a ruler of Han<sup>2</sup> or to a king of Chou. No prince of Han<sup>2</sup> reigned for as many as 37 years. On the other hand, the 37th year of king Hien of Chou was 332 B. C.; the 37th year of king Nan of Chou was 278 B. C. The date of the silver stands must be either 332 B. C. or 278 B. C.

In the introduction to my paper New Studies on Chinese Bronzes (BMFEA 9, 1937) I insisted on the fact that there is an important difference between ritual vessels and objects of everyday use as materials for dating grave finds. Ritual bronzes were not made for the purpose of being buried immediately after casting; this is evidenced by their inscriptions, which frequently end with a wish that the vessel may be »treasured and used by sons and grandsons«. They were intended, in the first place, for the ancestral temples, not for the graves. When we find both ritual vessels and secular objects of practical use in one and the same grave, we must conclude that whereas the latter are more or less contemporary with the grave, the ritual vessels have been cast *at least* a few generations earlier than their deposition in the grave. This fact is important in regard to the Kin-ts'un finds. The Piao bell inscription, dated 550 B. C., is worded as a commemoration of great exploits, and ends by a wish that, thanks to the inscription, they should never be forgotten in all future generations. The slightly older Si-tsi Hu inscription ends with the wish that »sons' sons and grandsons' grandsons should forever use it«. They were obviously not cast for immediate burial. The Piao bells and the Si-tsi Hu are extremely precious for the dating of the Huai style: they testify to a fully developed Huai style in the 6th century B. C. But for the dating of the Kin-ts'un graves they serve, at most, as a *terminus post quem*. We must allow for a lapse of at least a century (probably more) after 550 in determining the age of the grave in which the Piao bells were buried.

The Kin-ts'un tombs are Han<sup>2</sup> graves, which gives a lower limit of 230 B. C. The Piao bells and the Si-tsi Hu cannot very well have been placed in the earth earlier than circa 450 B. C. The numerous Kin-ts'un objects with incised

inscriptions may be approximately dated in the period  $\pm$  450—230 B. C. There is thus cumulative evidence which goes to show that the Kin-ts'un graves have to be placed in the period  $\pm$  450—230 B. C. Since there are no less than 8 graves, and since these graves cannot reasonably be expected to be all contemporaneous, we may conclude, with a fair amount of certainty, that the construction of the Kin-ts'un graves extends over a major part of the period  $\pm$  450—230 B. C.

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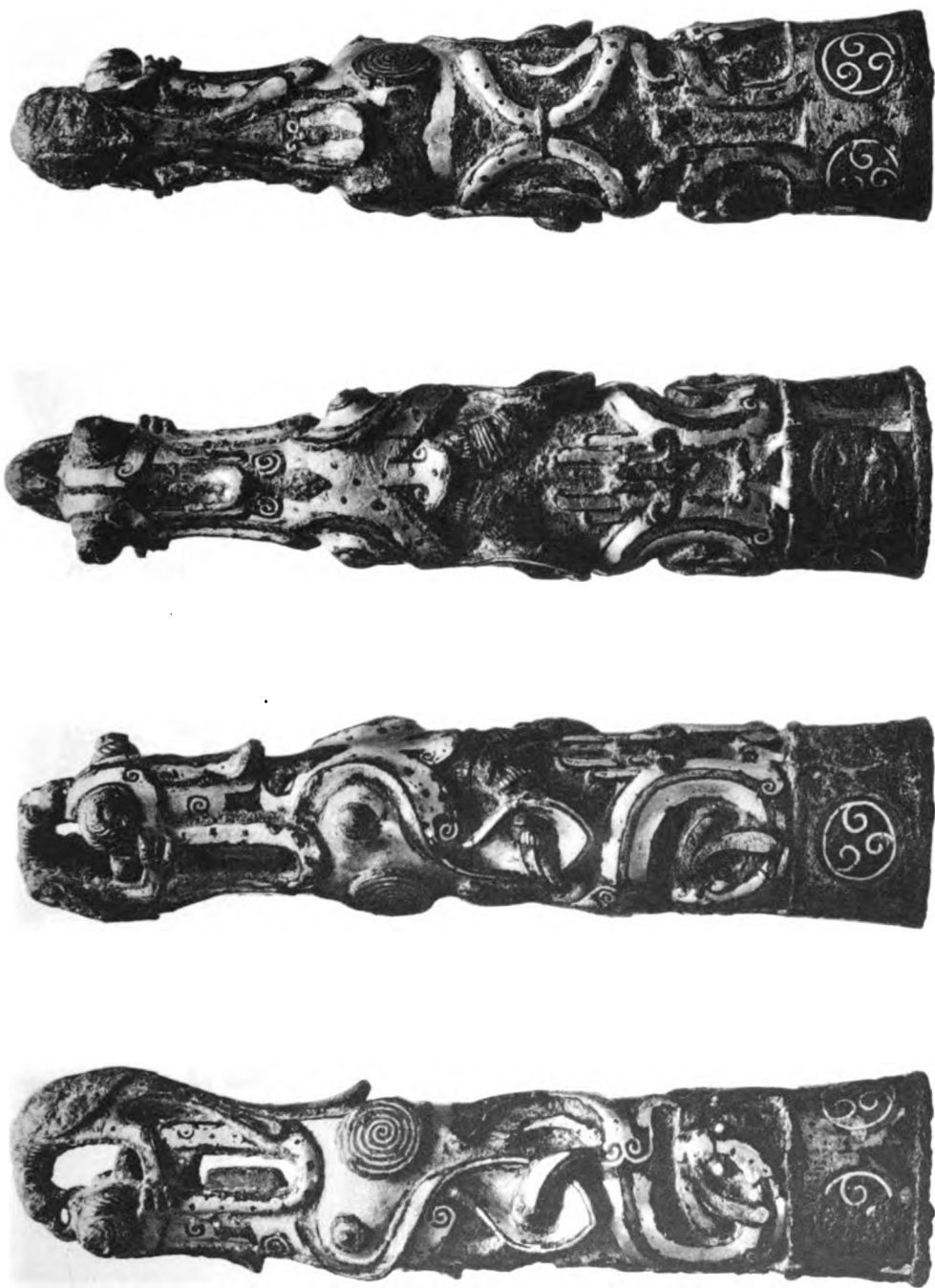




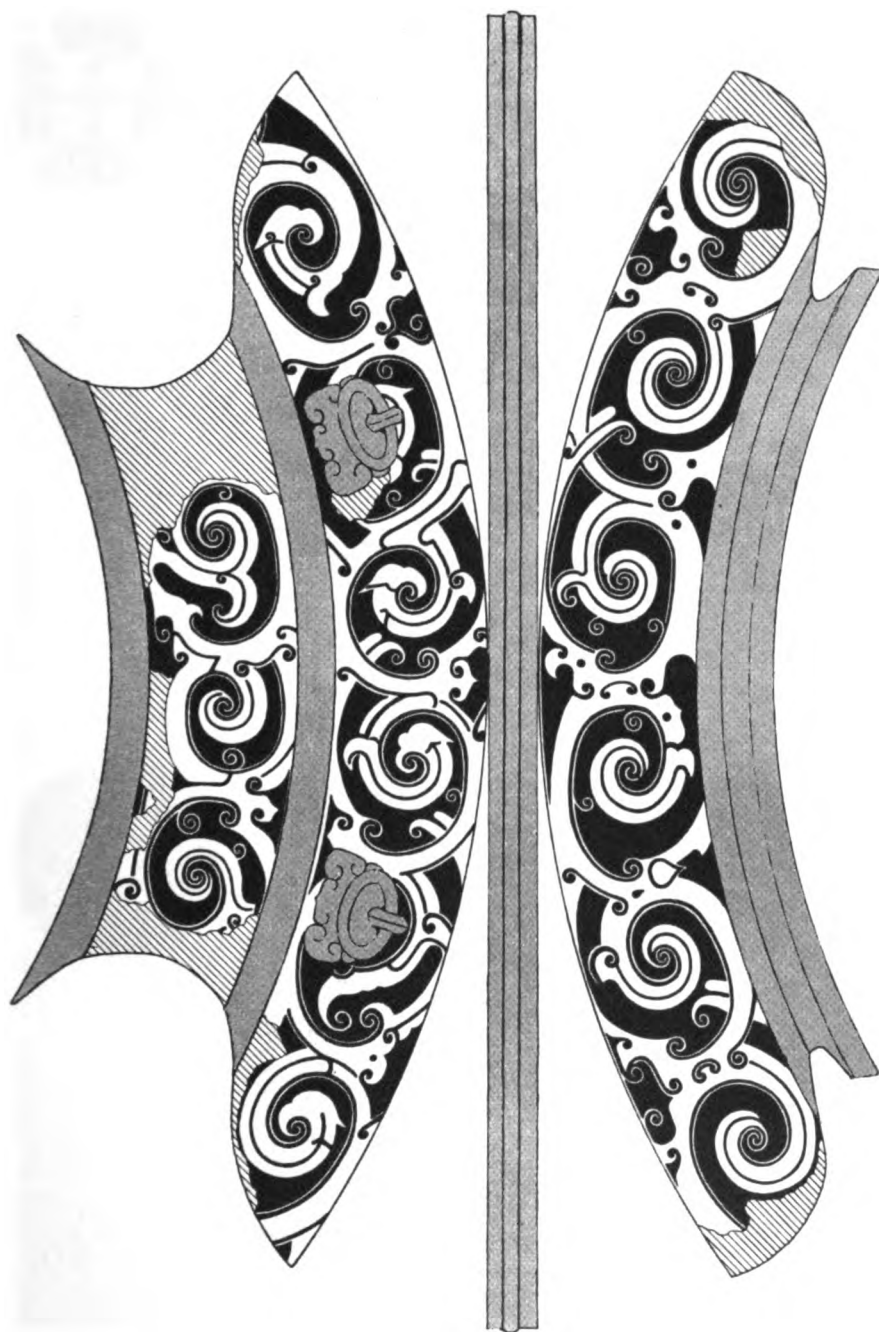










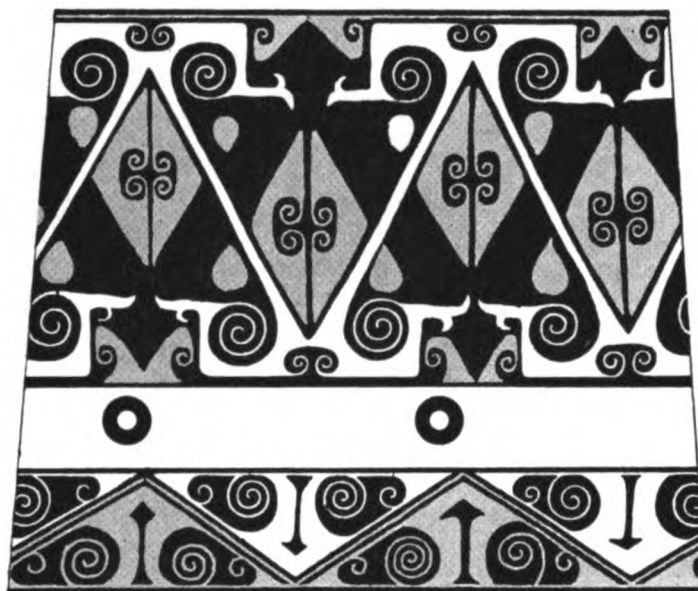


Grey = gold; white = silver; black = bronze





1



2



Grey = gold; white = silver; black = bronze







1



2 a



2 b

Grey = gold; white = silver; black = bronze



# SVEN HEDIN'S ARCHAEOLOGICAL COLLECTIONS FROM KHOTAN

## II

BY

*GÖSTA MONTELL*

The treatment of Dr. Sven Hedin's archaeological collections from the Khotan oasis in East Turkistan was begun in Bulletin No. 7. These objects were collected in 1896 and have not been described in detail since then. In the volume just mentioned the terracotta collection was dealt with, and a brief description was given of the finding of these objects, etc. The history of Khotan and its significance as a station on the road from East to West was emphasized there.

The study now continues with a description of the objects of metal, bone, and stone contained in the collection. Professor Helmer Smith of Uppsala has been kind enough to transcribe one manuscript leaf in Khotani Saka and one in Sanskrit, both acquired by Sven Hedin in Khotan, but now unfortunately lost. The numerous gems with engraved seals will be dealt with in a later paper.

### OBJECTS OF METAL.

Among the finds from the Khotan district, and especially from Yotkan, there is a large number of metal objects. There have been found numerous small images of Buddha, signets, mountings, and small objects of bronze, also objects of lead, gold, etc. Since those excavating the culture strata at Yotkan have solely been digging for treasures, many historically interesting finds have undoubtedly gone straight into the melting pot. The remainder have found their way to various museums and collections. Thus already Kiseritskij and Grenard reproduced several metal objects and Sven Hedin's travels of 1898 contain a selection from his collections.<sup>1</sup> The majority, however, are now being published for the first time. No metallurgic examination has been made of the objects.

#### OBJECTS OF BRONZE OR COPPER.

The great majority of the metal figures in Sven Hedin's collection are cast of bronze. Many of them are badly coated with verdigris and the details have consequently become undistinct, sometimes being almost impossible to discern.

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<sup>1</sup> Hedin 1898, Part II, p. 113.

Apart from the coins and the signets most of the objects are of a religious character.

What was said when discussing the clay figures from Dandan-Uiliq regarding the close relationship to Indian art is equally true with reference to the bronze figures and the fragments of such that are included in Sven Hedin's collection. Generally speaking greater difficulties appear to have been encountered in working the bronze and the detail work is fairly rough. Nevertheless it is stated that Khotan was known for its metal-work.<sup>1</sup>

The only large object made in two parts is a seated Buddha with a halo ornamented in relief, Pl. I, 1 a—c. The figure itself is solid and with the aid of two tenons at the back it was fastened to or behind the screen, in which there are two corresponding holes, as will be seen from the illustrations. The lower part of the figure is missing. It probably consisted of a lotus throne or at least of a lotus stalk similar to what is the case in some other images here illustrated. The screen is pointed and adorned with seven small images of Buddha in relief. The outlines of these images are all very indistinct, but they are undoubtedly of a type resembling the main figure. The grouping of seven Buddha figures occurs in other finds from Khotan.<sup>2</sup> In later Buddhism and in Lamaism there occur similar groupings especially in representations of Bhaisajyaguru, the god of medical science. Fragments of similar objects of wood were found by Stein especially at Domoko, east of Khotan.<sup>3</sup>

A standing figure of Buddha, the right hand raised to abhaya-mudra, is in all essential respects similar to the clay figures from Dandan-Uiliq<sup>4</sup> and other localities, but is very poorly and roughly made, Pl. III, 1. The features can no longer be traced and the folds of the dress are almost obliterated. It is possible that this simply is a figure that was never completed, i.e. which was never given the necessary finish.

A far superior finish is displayed by the image of Buddha Pl. II, 5, this not being apparent from the reproduction, which is blurred by the damage the figure has suffered from bronze-pest. Buddha is portrayed sitting with his legs crossed but with his feet hidden by the dress. His hands are resting in his lap, probably united in dhyana-mudra. The head is bent slightly forward. The figure is supported by a lotus throne with a stalk. Similar to what is the case with reference to Pl. I, 1 a—c, it is possible also here to discern a striking resemblance to the bronze figure from Jauliãñ that Marshall has published.<sup>5</sup> These are Indian forms imported to Khotan.

The small Buddha reliefs, Pl. II, 3, 6, 8, form a special group. The arrangement

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<sup>1</sup> Rémusat, p. 16.

<sup>2</sup> Hoernle 1902, Pl. XII, 5, 9. Kiseritskij, p. 185.

<sup>3</sup> Stein 1928, Pl. IX, 13, 14.

<sup>4</sup> Stein 1907, Pl. LIV, Stein 1921, Pl. X.

<sup>5</sup> Marshall 1921, Pl. XXVII b.

is the same in all the cases with the seated figure supported by a lotus throne or a console. Behind the figure there is always a plain aureole. It seems as if these small reliefs were intended to be attached to a background. Their resemblance to the previously described stucco fragments is striking.<sup>1</sup> The same type of small bronzes occur in other collections from Khotan.<sup>2</sup>

Some fragments appear to originate from unsuccessful casts that were never finished, Pl. II, 9 and Pl. III, 5.

It is really not worth while subdividing this limited and fragmentary materia according to style. One special group might possibly be made to consist of some bronzes characterized by a more thorough finish and a softer and more mobile shape than the others. Pl. II, 7 shows a seated figure, the right leg drawn up under the body, the left resting on the ground. The right hand holds a lotus stalk the leaves of which support an image of Buddha whereas the left hand is hanging down holding an object that may be conceived as a vessel for holy water. The figure wears a crown on its head and on the forehead there is an *ūrṇā* consisting of an inset chip of a turquoise. At the back there are two tenons with the aid of which the relief was attached to a bedding. It is not easy to say what divinity the figure is to represent, the attributes being so indistinct. If the object in the left hand really is to represent a vessel for holy water, this is probably an image of Bodhisatva Maitreya. The close relationship to the Gandhara art is apparent.<sup>3</sup>

The standing figure of Bodhisatva, Pl. II, 1, belongs to the same group. The same open crown on the head, the same lotus stalk and the object in the left hand, are all found also in this image. The collections in Leningrad include a very similar object, but it can hardly be correctly drawn as reproduced by Kiseritskij.<sup>4</sup> The fact that this type of representation was common in Khotan is confirmed inter alia by a beautiful wooden relief in Stein's collection.<sup>5</sup>

The majority of the bronze figures are presented in a frontal position. One of the finest fragments, Pl. II, 2, is a remarkable exception. Of the whole relief there remains but the head of a richly ornamented Bodhisatva (?) with a halo. The details of the hair ornament are difficult to determine but the impression as a whole very greatly resembles the Gandhara art. It is possible that this is an object imported directly from India.

The Buddhistic group may be considered to include a few more small objects. Pl. VI, 19, and Pl. VI, 16, have undoubtedly both been worn as amulets and ornaments. The cross-shaped *vajra* or thunderbolt has had a stone in the middle, which has now disappeared. Really this double thunderbolt should have four

<sup>1</sup> Montell, Pl. XIX, 2.

<sup>2</sup> Hoernle 1902, Pl. XII, 7. Stein 1921, Pl. VI.

<sup>3</sup> Foucher 1905/22, figs. 418—422.

<sup>4</sup> Kiseritskij, p. 186.

<sup>5</sup> Stein 1928, Pl. XIV (Har. 029).

arms, all alike, but one of them has been replaced by a ring.<sup>1</sup> It is here quite superfluous to go into the enormous importance of the *vajra* in Buddhistic symbolism and cult. The literature has numerous investigations and descriptions.<sup>2</sup>

The small elephant standing on a lotus console adorned with a chip of turquoise, Pl. VI, 16, immediately reveals its Indian origin. At the top it has had a suspension-ring. From time immemorial the elephant has been the object of religious worship especially in India whence the belief in his sacredness and wisdom has spread wide and far. In modern Buddhism the elephant plays an important part and figures of elephants are always occurring in the symbolism and as stands for valuable offertory vessels, etc.

Among the finds from the Khotan district there are other images of elephants.<sup>3</sup> I shall revert to this motif when discussing the signets.

Among the smaller bronzes in the Hedin collection there are several directly corresponding to the previously described objects of terracotta. There are three miniature pots, Pl. VI, 15, 20, 21, which must have been toys or amulets.<sup>4</sup> Nor is the bird, Pl. VI, 10, new as regards type. It is furthermore so badly corroded that all details have vanished. The miniatures of monkeys, so prominent among the terracotta finds, are here represented by a typical head, Pl. VI, 23, and by a crouching figure supporting its elbows against its knees, Pl. VI, 12.<sup>5</sup>

The small, beautifully made bronze Pl. VI, 24 may possibly have been part of the ornamentation of the roof of a miniature stupa. The lower edge of the seated lion is curved, probably in order that it may be placed as an ornament on the roof-tree. Ever since the very earliest days of Buddhism, stupas of various sizes and materials have been used as reliquaries, ornaments on altartables, etc. Their prominence in the Khotan architecture in the 5th century A.D. was confirmed by the Chinese pilgrim Fa Hsien.<sup>6</sup>

The fact that many currents of culture have met in the Khotan district during the course of time is proved also by this small collection. The mounting Pl. IV, 8 represents a type that has an enormous spread throughout Siberia, Russia, Hungary, Scandinavia, etc.<sup>7</sup> This spread has probably been brought about *inter alia* by the migrations of the Finno-Ugrian peoples.

The bronze Pl. IV, 9 may be referred to the same group. It is conspicuous by its very elegant finish with an animal resembling a lion, in full run. Also this type with its slit is widely spread.

<sup>1</sup> Cf. Coomaraswamy 1935, fig. 28.

<sup>2</sup> Coomaraswamy 1935. Waddell 1894, pp. 15. 27 etc. Getty, p. 51. Grünwedel 1920, pp. 85, 93, 112.

<sup>3</sup> Stein 1928, pl. XII. etc.

<sup>4</sup> Cf. Montell, pl. XVII. Kiseritskij, figs. 33—34.

<sup>5</sup> Cf. Montell, pls. XV—XVII.

<sup>6</sup> Cf. Montell, p. 148.

<sup>7</sup> Arne, p. 132 *et seq.* Fettich, figs. 61, 81, 88.

Pl. IV, 4 is unfortunately broken but it could hardly be doubted that this bronze is related to the rich material published by Arne.<sup>1</sup> Also this specimen in the Hedin collections is decorated with single palmettos placed alternately opposite each other.

Volume 7 of this Bulletin contained a description of the two interesting bifrons vessels in Sven Hedin's collections.<sup>2</sup> The bronze objects also include such a double head, Pl. VI, 22. Unfortunately the surfaces are so worn and corroded that it is impossible to see if also in this case one face was that of a man and the other of a woman. The head has been pierced from the crown to the neck and has probably been threaded on a piece of string or a chain.

The collection contains four fragments of bronze bracelets, Pl. IV, 6, 7, 10, 11. Unfortunately they are all so short that it is hardly possible to obtain any definite impression with regard to shape and dimensions, but all four have been open for they terminate with the head of a snake or a dragon. There is no doubt but that these armlets belong to the same cultural complex as the strap-fittings previously described. Several armlets of the same type have been unearthed in Hungarian grave-fields,<sup>3</sup> and they are also found in collections from South Russia.<sup>4</sup> Undoubtedly armlets of similar types occur within the whole Scythian and Finno-Ugrian sphere of distribution.

It is evident that several of the metal objects have been intended to be used as decorations on some other foundation, straps or the like. This also applies to the lion illustrated in Pl. IV, 12. There are still remains of rivets on the reverse side. It is impossible definitely to decide whether or not this lion is contemporary with the rest of the collection. Its material, etc., is different from that of the other metal objects. Apparently it is of a decidedly Persian character.

No complete, undamaged bronze vessels appear to have been found at Yotkan, which is quite natural seeing that the locality would seem to have been rather soggy. A few fragments occur in Sven Hedin's collection. Pl. IV, 2 represents an animal figure, evidently at one time serving as a handle on the edge of a vessel. The details are almost entirely obliterated by verdigris, but it is possible to distinguish the slightly projecting ears and the line denoting the mouth. The front legs have rested against the edge of the vessel, the hind-legs against the vessel below the neck. We are thus confronted with a direct parallel to the many handles of pottery found at Yotkan.<sup>5</sup> I know of no similar find from other collections.

A vessel whose mouth had a diameter of about 16 cm, is represented by a fragment of the edge, Pl. IV, 1. The vessel itself is exceedingly thin, the edge being strongly reinforced. The fragment displays no traces of ornamentation.

<sup>1</sup> Arne, figs. 130—163.

<sup>2</sup> Montell, pp. 158—159.

<sup>3</sup> Fettich, Pl. 44 : 18—19, 47 : 5.

<sup>4</sup> Ebert's Reallexikon, B. 13, T. 43 B.

<sup>5</sup> Montell, Pl. IV, 4. pp. 160—163.

*Bronze objects from Tavek-kel.*

On the 18th of January, 1896, Sven Hedin's caravan rested in the little village of Tavek-kel, four marches north of the town of Khotan. There he bought three archaeological objects reproduced in Pl. IV. Closer details as to their origin are lacking but presumably the objects were found in the deserts between Khotan-darya and Keriya-darya.

The spoon, Pl. IV, 15 represents a wide-spread type whose occurrence among the finds from Jauliāñ indicates that it migrated with Buddhism to Central Asia. The handle of the spoon is broken off also on the specimen from Tavek-kel.<sup>1</sup> The pointed oval shape of the bowl recurs in finds *inter alia* from Corea.

The ladle Pl. IV, 13, however, is a more uncommon type. The bottom is flat so that the ladle does not topple over if laid on a smooth surface. Apparently it originally had a handle inserted in the tube intended for that purpose, attached to the round bowl. Bergman presents a similar find from Lop-nor.<sup>2</sup> Nothing but guesses can be made regarding its use. It must be considered out of question that it is an ordinary spoon or ladle. Nor is it likely that it was used for melting metals, the handle being so short. In certain sacrificial ceremonies at the Lama temples similar ladles are used in our days, but they are generally more richly ornamented. The Indian origin of these fire sacrifices is irrefutable, however, and is further confirmed by some of the offerings burnt being stated to be fetched from India.

The chronological determination of the arrow-head Pl. IV, 14 is impossible as yet. This type with a long tang to be inserted into a tubular shaft is very common in Asia. Several related finds exist from East Turkistan.<sup>3</sup>

*Signets.*

Among the objects purchased by Dr. Hedin at Khotan there are 23 metal signets of different sizes. They have been used for sealing letters, etc., which is best demonstrated by Stein's finds, *e. g.* at Niya.<sup>4</sup> There he discovered several unbroken letters in an excellent manner illustrating the arrangement of seals and strings. The documents are from the third century A. D.

The above mentioned signets vary as regards shapes and intaglios. Probably they differ very considerably in age, too, this being very difficult to prove, however. They generally consist of a bronze plate, one flat surface of which is engraved with a figure or an ornament. On the back there is a small loop for the string. The most common shape is square, but the collection also includes four round, two rectangular, one octagonal, and one entirely irregular, resembling more than anything else an animal head with horns.

<sup>1</sup> Marshall 1921, Pl. XXVII h. Cf. Bergman 1936, pp. 98—99, where there is a survey of the spoons found in East Turkistan.

<sup>2</sup> Bergman 1938.

<sup>3</sup> Stein 1921, Pl. VI. Stein 1928, Pl. XLVII, Pl. CXI, Le Coq, 1925, fig. 115 (from Kutch).

<sup>4</sup> Stein 1921, Pl. XX.



The intaglios can be subdivided into two main groups, animal motifs and pure ornaments. Strangely enough the variation appears to be comparatively small, the same motif recurring surprisingly often. The heraldic seated lion occurs thrice among these 23 signets. In addition specimens occur in other collections.<sup>1</sup> Another favourite motif is the animal resembling a deer with large antlers, shown in Pl. VI, 1—3, which is the centre of three intaglios.<sup>2</sup> It has undeniably a certain general resemblance to the deer of the Ordos bronzes.

The svastika is the commonest symbol on the metal signets — it occurs 6 times on these 23 signets and in addition on 2 signets of stone, the age of which is doubtful. In three cases it constitutes the only motif, in the other three it fills one field of the quartered surface, the remaining fields having a diagonal cross, quatrefoil, trefoil. I shall revert to them below.

As is well known, many reports and books have been written about the swastika, its origin and its significance, and there are innumerable explanations.<sup>3</sup> In this connection it is sufficient to establish the significance of the svastika as a Buddhistic symbol. Also in India the history of the svastika no doubt dates back to far older periods, best demonstrated by a reference to the discoveries of signets with the svastika made by Marshall in Mohenjo-Daro.<sup>4</sup> The incorporation of the symbol with the special Buddhistic sphere of forms has undoubtedly been of enormous importance for its dispersion in East Asia. It is popularly said to be a sign of Buddha's heart, the symbol of endless motion, eternity, etc. On the whole the svastika is a propitious symbol.

Great importance is ascribed to the direction in which the cross moves, and different sects and faiths adhere fanatically to one or the other. Earliest Buddhism, however, does not seem to have attached decisive importance to this. For instance, Buddha's footprints on the reliefs from Amaravati contain both types on the same picture.<sup>5</sup> Both types are also represented on the signets in Sven Hedin's collection as is seen from Pl. V.

It has not been possible definitely to explain the type of intaglio portrayed in Pl. V, 1—3, although the figures of the four fields undoubtedly are symbolical. It is evident from the relatively frequent occurrence of these intaglios that the motif has been of special significance. There are three specimens in the Hedin collection, all reproduced here, one in Folke Bergman's from Cherchen, and one in Stein's collection.<sup>6</sup> Hoernle reproduces a similar intaglio, although not quite identical.<sup>7</sup> The group of symbols may possibly be conceived as the arms or

<sup>1</sup> Cf. Hoernle 1899, Pl. III. Stein 1921, Pl. V.

<sup>2</sup> Cf. Stein 1907, Pl. L.

<sup>3</sup> Cf. Lessing, p. 78. MacKenzie, pp. 1—46. Waddell, 1894, p. 389. Villiers, p. 102. Williams, p. 351, Wilson.

<sup>4</sup> Marshall 1931, Pl. CXIV.

<sup>5</sup> Wilson, p. 802.

<sup>6</sup> Stein 1921, Pl. V.

<sup>7</sup> Hoernle 1899, Pl. III, 77.

sign of a religious sect or a group of monasteries. A comparison with a find from Khotan, which I consider particularly interesting, is especially instructive. Grenard reproduces a cross, originally almost equibranchiated, one arm now being missing.<sup>1</sup> The middle section is in the shape of an octagonal seal of the same type as in Pl. V, 5, but with the three Chinese characters Ta Sin Ki. Two of the branches of the cross end in seal-like fields containing the letters KHIX, while the third is occupied by a square figure of a seal with four fields, which seems very closely related to the seals just mentioned in Hedin's collection. Undoubtedly there is a connection between them. Grenard explains the remarkable cross as a Christian-Nestorian and this can probably not be doubted. Certainly the field with trefoil is replaced by another fylfot but nevertheless the agreement is palpable. This find of Grenard's should mean that these seals must be considered as reminiscences from the Nestorian age.<sup>2</sup> This has not led us to a real explanation of the motif, but a solution will probably be arrived at later. Judging from the description, the cross described by Grenard is also a seal, there being a loop on the reverse in which to fasten the string.

The subdivision of the surface of the signet into four fields occurs in Stein's collection from Niya.<sup>3</sup>

The motif on the signet Pl. VI, 6 is probably also related to the svastika. It is crudely and summarily made.

It is known and acknowledged that the ornamentation of primitive art was first of all of symbolical importance, also that this is true with reference to the earliest art in India. During the first centuries of Buddhism no images of the founder of the religion himself occurred, nor of the figures in the legends. Symbols, the meaning of which could be understood by one and all, replaced palpable images.

In a few monographs Foucher has presented the results of his thorough investigations in this sphere.<sup>4</sup> He points out that first the attempts at the making of images consisted of the amulets or souvenir coins that were made at the four most important places of pilgrimage, where the »four great miracles» were commemorated. These places were Kapilavastu, Bodh-Gayā, Benares, and Kusinagara, which according to the legend were the scenes of Gautama Buddha's birth, his first revelation, first sermon, and his passing into Nirvana. On the reliefs from Sanchi, Barhut, and Amaravati, richly ornamented with scenes from the legends, Buddha is still often represented by a symbol, not in human shape. There was perhaps no prohibition against representing humans in pictures, but the great reverence and tradition prevented the development for a long time.

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<sup>1</sup> Grenard, fig. 7, pp. 134—135.

<sup>2</sup> Cf. Saeki.

<sup>3</sup> Stein 1907, Pl. LXXII.

<sup>4</sup> Foucher 1917 and 1934.

Judging from all facts it would appear that Buddhism took the use of certain symbols from its predecessors.<sup>1</sup>

According to Foucher's very convincing investigations the birth of Buddha is symbolized by the lotus flower, his first revelation by the tree, his first sermon by the wheel, and Parinirvana by the grave-mound or the stupa.

In our collection of seals there are undoubtedly Buddhistic motifs, and it is especially easy to recognize the lotus flower, which in five instances is the only motif on the seal, Pl. V, 5, 8, 9, 11, Pl. VI, 18. The schematization has gone very far in some cases, but nevertheless I consider that we can be convinced that the determination is correct also with reference to Pl. V, 8. An early special development of the motif is represented by the vase with the decoratively arranged flowers, Pl. V, 11. A great variety of this type occurs already at Sanchi and Barhut, and it has long remained extremely popular, it being possible to demonstrate several specimens in East Turkistan material. Its occurrence in the ruin-field of Lou-lan is also confirmed by Sven Hedin's collections.<sup>2</sup>

The Indian origin of the lion motif was touched upon already in connection with the publishing of the terra-cotta finds from Yotkan.<sup>3</sup> Gautama Buddha also has the title of Śākya-simha — the lion of the tribe of Śākyas — and the royal animal is generally considered to be a symbol of Buddha. Among the signets there are three that portray lions of heraldic type, seated on their hind-legs and with one front-paw raised.<sup>4</sup> Two of them are rather indistinct, Pl. VI, 7, 8. The sitting posture of the lion is typical of the sculptures crowning the Asoka columns and also of some early Indian reliefs.<sup>5</sup> It is difficult to explain why the paw is raised unless the intention simply is to denote a position of adoration.

Three signets, two of which are round, depict a deer-like animal with huge antlers supplied with heavy points, Pl. VI, 1—3.<sup>6</sup> The two round signets portray the animal walking with bent fore-leg. The surface is filled with some round hollows. The interpretation of the motif is vague, but the position as holy animals held by deer and gazelles within Buddhism should be remembered. It is said that Gautama Buddha was reincarnated eleven times in the shape of a deer<sup>7</sup>, and the fact that he delivered his first sermon in the so-called Gazelle Park at Benares has had the result that gazelles and deer have become symbols of the holy doctrine.

The elephant, Pl. V, 12, too, has connections with the religious conceptions. We know through the researches made by Foucher that the oldest presentations

<sup>1</sup> Coomaraswamy 1935.

<sup>2</sup> Bergman 1936, Pl. II.

<sup>3</sup> Montell, pp. 160—161.

<sup>4</sup> Cf. Hoernle 1899, Pl. III, 61. Stein 1921, Pl. V. Stein 1907, Pl. L (Y. 007a).

<sup>5</sup> Smith, fig. 29, Pl. 33 and fig. 101.

<sup>6</sup> Cf. Stein 1921, Pl. V (Yo. 00143).

<sup>7</sup> Ball, p. 115.

of Buddha's first bath show two elephants pouring water over the newly born child.<sup>1</sup> The part played by the elephant as a symbol has already been touched upon. The picture on this signet is not quite distinct, but it looks as if the elephant has an object on its back, possibly to be interpreted as a so-called *cintamani*, a »holy gem« or a shrine. The interpretation is perhaps a bold one, but can be defended when considering parallels from later Buddhistic art. Thus Adam reproduces a box from Bhotan with a relief representing an elephant carrying *cintamani*.<sup>2</sup> A comparison with a signet from Aq Sapil seems to me to prove the purely religious character of the motif.<sup>3</sup>

The running neat, the engraved motif in Pl. V, 10, hints at an Indian origin. A beautiful signet from Yotkan representing a cow being milked is included in Stein's collection.<sup>4</sup> In his presentation of a small collection from Yotkan, Skrine mentions »two square metal seals, one with a classical winged bull intaglio«.<sup>5</sup> It is evidently this specimen that is reproduced on the cover of his book. No doubt the motif is related to our seal, which, however, is cruder.

Pl. VI, 5 deviates in more respects than one from the signets so far dealt with. Its shape is irregular and the engraving very shallow. It is extremely difficult to say what the greatly conventionalized motif originally was. It would be tempting to guess at the head of an animal with short horns. This, however, is contradicted by there being no sign of eyes and ears, while in their place there is a motif resembling a palmetto.

In spite of the variations, the signets so far described are of mainly the same character, for which reason there is hardly reason to assume anything but local manufacture within the Khotan district. There is a signet in the collection, however, which deviates in many respects from the foregoing, Pl. VI, 9 a—b. The stamp itself is square and very thick and has a loop occupying nearly the entire width. Most noticeable, however, is the engraved figure representing a quadruped of a very fantastic shape. It seems to represent a griffin or a dragon. There are parallels in Stein's collection from other parts of East Turkistan. Particularly from Kucha he reproduces signets closely related to this specimen in Sven Hedin's collection.<sup>6</sup> Specimens of an almost similar type are occasionally made of stone and then often have a decided Chinese character.

The rectangular signet Pl. VI, 4 a—b, makes a strange impression among the others. It has three Chinese graphical signs of a lapidary style. The interpretation being uncertain, no attempts at reading can be made here. In other respects, too, it deviates from the rest for they all have the figure itself sunk, engraved

<sup>1</sup> Foucher 1934, p. 13.

<sup>2</sup> Adam, p. VIII.

<sup>3</sup> Hoernle 1899, Pl. III, 53.

<sup>4</sup> Stein 1907, Pl. L (Y. 009K).

<sup>5</sup> Skrine, p. 171.

<sup>6</sup> Stein 1928, Pl. CXI.

or cast, causing the motif to stand out in the seal. But in this instance the graphical signs are in relief. It is therefore probable that signet paint was used in the same manner as is customary in China to this day. The decoration on the sides of the heavy seal are of a Khotan character, however, The rings with a dot in their centres may be compared with the object of bone, Pl. VIII, 15. The loop, too, is of a type unknown among the Khotan signets.

In the foregoing the common term »signet» has been retained, but I must stress that no signet impression with pictures of the type described are preserved in spite of our now being in possession of fairly comprehensive material. A natural explanation is perhaps that these large »signet pictures» were used for some special purpose, e. g. for the stamping of clay amulets.

#### OBJECTS OF IRON.

Several objects of iron emanating from the first millennium of our era have been found in East Turkistan.<sup>1</sup> Very little, however, is preserved from the old capital, Yotkan, probably for the reason that rust has annihilated the objects.<sup>2</sup> Most of the finds from East Turkistan consist of fragmentary tools, cooking-vessels, arrow-heads, etc.

In Sven Hedin's collection there is a small relief with an image of Buddha, Pl. II, 4, of the same kind as on the bronze reliefs previously described, Pl. II, 3, 6, 8. It is completely covered by a coating of rust, but the figure is perfectly distinct, portraying a seated Buddha with a slightly pointed aureole behind. The object is of great interest, proving as it does that iron was used also in the manufacture of figures of a religious character.

A greatly disintegrated, rectangular bead, not reproduced here, is possibly of the same material or rather has been covered with paint containing iron compound. Signs are visible on the four sides, and there is a possibility that the bead also served as a kind of seal.

#### OBJECTS OF LEAD.

It is not unreasonable to presume that bronze was of a comparatively high value in Khotan, there hardly being any mines in the immediate vicinity. Lead, which was cheaper, has also been used, as is indicated by the finds. There are some specimens in the Hedin collections and Stein mentions several finds of lead.<sup>3</sup>

The small, thin, fragmentary relief, Pl. VI, 13, is of special interest. Evidently it represents a divinity, probably a Bodhisatva, richly ornamented. On his head he wears the diadem with a row of pearls and a large upright round disc in the

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<sup>1</sup> Andrews, p. 8.

<sup>2</sup> Cf. Stein 1921, p. 119.

<sup>3</sup> Stein 1921, p. 116. Stein 1928, p. 110.

middle characteristic of the Gandhara figures.<sup>1</sup> The same head ornament recurs in numerous variations among the paintings in the ruins of temples in northern East Turkistan, *e. g.* at Ming-Öi.<sup>2</sup> Contrary to what is the case in the cultural districts mentioned, the upper part of the body of the lead figure now under consideration is covered by a cloak draping the breast with a long pointed flap, which arrangement also occurs in terra-cotta figures from Khotan.<sup>3</sup>

The small standing figure of a monkey Pl. VI, 14 differs only slightly from the large group of miniatures previously discussed.<sup>4</sup> In this case the material has made possible a more slender shape, that is the sole difference. The small bird, Pl. VI, 11, is made of the same material.

What the object reproduced in Pl. VI, 17 really is supposed to represent is difficult to say. Probably it is a pendent carried in a chain or a ribbon. Possibly it may be supposed to represent a fruit.

#### OBJECTS OF GOLD.

It is evident from the quotations in Bulletin 7 that gold was used extensively for the decoration of stupas and temples in the formerly wealthy Khotan.<sup>5</sup> Treasure hunters know, too, how to wash out remnants of goldleaf and gilding<sup>6</sup>, and there is no doubt but that several gold objects have been brought to light, but quickly and unnoticeably they have disappeared into the melting-pot. Stein has really only one remarkable gold object from Yotkan, a small figure of a monkey, acquired in April, 1901.<sup>7</sup> There is a limited number of finds from other parts of East Turkistan.

Sven Hedin was successful in procuring eight objects of gold in Khotan in the year 1896. Six of them were reproduced in his travels.<sup>8</sup> The acquisition of one of them is mentioned in a previously cited notation in a diary, that notation apparently referring to Pl. VII, 5.<sup>9</sup> All these objects were presumably used as adornments and ornaments, this being apparent from the fact that most of them have holes or rings to which should be attached a ribbon or a chain. The reproductions in Pl. VII are enlargements to facilitate the study of the objects, the exact sizes being stated in the list of plates.

The most striking find is the little cherub with wings, Pl. VII, 2. It is pressed or chased of a thin plate of gold, the reverse is flat and of the same material.

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<sup>1</sup> Foucher 1905/22, figs. 396—397, 413, etc.

<sup>2</sup> Grünwedel 1912, figs. 243—244, 355, 357, etc.

<sup>3</sup> Hoernle 1902, Pl. IX, 2.

<sup>4</sup> Montell, pp. 189 et seq.

<sup>5</sup> Giles, p. 5 (quoted from Fa Hsien).

<sup>6</sup> Stein 1907, p. 194.

<sup>7</sup> Stein 1907, pl. LI (Y. 004).

<sup>8</sup> Hedin 1898, p. 98.

<sup>9</sup> Cf. Montell, p. 151.

The work is fairly crude, and it is impossible to discern what the figure is holding in his hands. Probably the gold object in question was imported. Its Hellenistic character is undeniable. Close parallels occur in finds from Western Asia.<sup>1</sup>

The two miniature birds, Pl. VII, 1 and 3, are decidedly Yotkan, the material only having permitted greater elegance than when bronze or pottery was used. Eyes, beak, and feathers are denoted by punched lines and dots.

Pl. VII, 4 is a small round disc with pressed ornaments, not intelligible. Probably this is merely a fragment. The pendent Pl. VII, 6 has had a pressed figure in relief, which, however, no longer can be interpreted.

The remaining three objects are coins which have been used as ornaments. Already in Dr. Hedin's first description they were said to be Byzantine, and with the kind assistance of Dr. N. L. Rasmusson of the State Historical Museum I have been able more definitely to determine them. They are all old Asiatic copies of genuine Byzantine coins but barbarized, the details, too, being partly erroneous. Their prototypes were probably coined during the early part of the sixth century A. D. and belong to the kind of coins termed Solidus. The obverse of Pl. VII, 5 shows the picture of the Emperor Justinianus I, the reverse a winged Victoria. The type occurs after the year 538.<sup>2</sup>

Pl. VII, 7 is very thin and indistinct but is probably of a type that in Byzantium was discontinued in the year 538.

The very thin round disc that has been folded twice, Pl. VII, 8, is also an attempt at a copy of a Solidus. Only the reverse has been coined, however, displaying an indistinct Victoria.

The counterfeit coins confirm the lively connections between East Turkistan and the countries around the Mediterranean as late as in Byzantine times.

## OBJECTS OF STONE.

Khotan is of old famous mainly as a place where jade or jadeite is found, the stone being obtained especially from the old river-bed of Yurung-kash. Sven Hedin's collection, however, contains no finds of jade objects that can definitely be claimed to be old, but there are, on the other hand, some relatively modern ones which will not be treated in this connection.

It is apparent both from literary sources and archaeological finds that the working of jade was of great importance already during the town's time of greatness. Other materials are also made use of for carved and sculptured figures, and this collection also includes a number of alabaster miniatures. This loose material permits a certain liberty in the shaping of the figures. On the other hand alabaster is very fragile and the surfaces sensitive to wear.

The sphere of motifs is the same as that occurring in the case of clay figures

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<sup>1</sup> Cf. Sauerlandt, Pl. 29.

<sup>2</sup> Cf. Warwick Wroth, Vol. I, p. 26, Pl. IV.

and small bronzes. Pl. I, 2 and Pl. VIII, 12 are undoubtedly of a Buddhistic character. The first-mentioned fragment originates from an uncommonly large figure, displaying the head of a Buddha still presenting traces of paint and gilding. The gold was laid on a coating of dark reddish brown paint. The aureole appears to have been blue. The small, fragmentary but well-shaped image of a Buddha, Pl. VIII, 12, on the other hand, has been coated with red paint, possibly excepting the hair which seems to have been dark.

Some of the other small figures, too, are palpably related to India where Hellenistic influence asserted itself. Pl. VIII, 8, especially, is characterized by its smooth and elegant shaping in agreement with the reliefs of the Gandhara art. This little figure, too, has elongated lobes of the ear which would seem to indicate that it is related to some Buddhistic motif. One might possibly conceive a connection with the common representations of Buddha as a child, his baptism, his first steps, etc. The same material for Buddhistic small figures is repeatedly found among Stein's finds.<sup>1</sup>

The monkeys typical of Khotan occur also here. The small seated monkey Pl. VIII, 2, supporting its head against its right hand and with its tail drawn in under the body, might just well be made of pottery. Nothing but the material distinguishes it from the miniatures of monkeys previously discussed. Pl. VIII, 5 shows a large head of a monkey attached to an emaciated body, the arms of which are merely indicated. The lower part of the figure is lacking.

Miniatures of birds were found made of pottery as well as bronze, and they recur also of alabaster, Pl. VIII, 3. The head has been pierced through the eyes, this probably having been made in order that it may be suspended. All the miniatures were presumably worn as ornaments or amulets. The large human figure, Pl. VIII, 6, is very rudely made. The whole character of the work causes a suspicion that it is of a later date.

With reference to a fragmentary figure of a boy Stein expresses the supposition that it was imported straight from Gandhara.<sup>2</sup> Sven Hedin's collection is found to contain a parallel, but better preserved and of a more elegant finish, Pl. VIII, 9. The similarity does not cover all details. Our specimen is thus absolutely frontal, whereas the one first mentioned is holding something in his right hand and furthermore has a row of pearls (?) around the waist. It is quite likely that figures of this kind served as amulets, used similarly to what was the case in China, the women wearing small ivory, bronze, or china images of boys when they prayed for sons. The whole character of the work, however, undoubtedly indicates a relationship to India, as was pointed out already by Stein.

Pl. III, 4 shows a figure that is unfortunately very incomplete, the upper part being entirely missing. The material is a kind of dark sandstone. The figure

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<sup>1</sup> Stein 1907, Pl. XLVIII. Stein 1921, Pl. VI. Stein 1928, Pl. X.

<sup>2</sup> Stein 1921, Vol. 1, p. 100; Vol. IV, Pl. VI (Khot. 02. 0).



has been a representation of a seated, richly ornamented god, placed on a stand covered with lotus leaves. It is hardly possible more definitely to determine the figure.

Among the smaller objects of stone I believe Pl. III, 2 and 3 to be of special interest. Both consist of pegs that taper slightly downwards, the section of one being round, of the other square. A closer study of Pl. III, 3 immediately attracts attention, it then being found that the upper part is in the shape of a fist. This at once brings to mind an amulet against »the evil eye». The fact that this specimen is not unique for Khotan is proved by one of Hoernle's plates.<sup>1</sup> According to Seligmann the belief in the dangerous influence of the evil eye is especially developed among the Turkish tribes<sup>2</sup>, but there is scarcely any reason to believe that the finds here mentioned have anything to do with the present-day population of East Turkistan. We know well enough the enormous importance that Greeks and Romans attached to the evil eye, and the amulets against that danger consisted of miniature hands of various materials.<sup>3</sup> In Tibet, too, the use of such hand-amulets is known.<sup>4</sup> I have not been able to find any modern specimen from East Turkistan but this may depend on the fact that I have had no really thorough study of East Turkistan life at my disposal. The probable explanation is that the old population of Khotan learnt the idea by way of Northern India, influenced by Hellenism.

At the top of Pl. III, 2 there is an engraved ornament or possibly a graphical sign, the interpretation of which has not been possible.

## OBJECTS OF BONE OR IVORY.

Sven Hedin's collection contains no very large number of objects made of this material. In one or two cases the age of the objects is doubtful, certain details indicating a comparatively late date.

The most beautiful object is perhaps the upper part of a comb, in whose fret-work top there are carved two seated figures, P. VIII, 13. All the teeth of the comb are broken away. The figures are framed in a circle with a carved row of pearls, which is found on both sides of the comb. Both of the figures, which represent a man and a woman, support one knee against the circle. The man's left arm encircles the woman's shoulders, his right hand holds hers, which is resting on his knee.

I know of no corresponding figural representation from the Khotan district, but if we turn to the Gandhara art parallels are easily found. It would appear beyond doubt that we are here confronted with an offshoot of »the tutelary pair»

<sup>1</sup> Hoernle 1899, Pl. XIX, 18.

<sup>2</sup> Seligmann 1922.

<sup>3</sup> Villiers, p. 171 *et seq.* Cf. also Westermarck. Vol. I, pp. 414—478.

<sup>4</sup> Seligmann 1910, Vol. II, p. 197.

whose mythological significance and evolution in the history of art were discussed by Foucher.<sup>1</sup> The god of wealth and the goddess of fecundity and plenteousness have been united in a symbol of happiness and conjugal fidelity. It is the demigod Pancika, ruler and general of *yakshas*, and his consort Hariti, that has developed into a patron and author of numerous progeny, originally having been a child-devouring demon. It is extremely interesting to note how this representation recurs with different contents of ideas throughout the whole Graeco-Roman world. Foucher has made a survey of the reliefs of pairs of gods in Gaul and in India, and he says, *inter alia*, »Such as they are, these groups — which, besides, are nearly contemporaneous — seem to us to furnish for the moment one of the most palpable verifications of the fact that in the first centuries of our era the sculptors of the Gauls and those of Ariana had each learned at the school of the Greeks, and spoke from one end of the ancient world to the other the same common language, the same artistic 'koinê'.»

The find from Khotan here described is another step eastwards and northwards in the migration of the motif, and in present-day lama images of gods it should be possible to trace offshoots.

A comparison between the carved comb and the sculptures reproduced by Foucher results in many details being found to be in agreement with each other and also supplies the explanation of the object that the female figure holds in her left hand. It is simply the classical horn of plenty which very soon appears to have got another shape in India where the animal horn was no suitable divine attribute.<sup>2</sup>

This type of comb with a curved top seems to have been the most common one in East Turkistan judging from the numerous finds reproduced by Stein<sup>3</sup> and it still subsists in the same territories.<sup>4</sup>

The richly carved plate, in deep relief and slightly convex, Pl. III, 6, presents some problems difficult to solve. Its outer shape is complete, but unfortunately the central figure is considerably damaged. Along the edges there is a row of small holes indicating that the object has been attached to some kind of support. The ornamentation is undoubtedly of a Buddhist-Tantric character, its close relationship to other Khotan art of Indian origin at the same time being palpable. It is thus possible to compare the fluffy tail-feathers of the birds with human upper parts of the body that support the vessel for holy water at the bottom with fragments of pottery from Yotkan.<sup>5</sup> The upper half of the relief contains a hexagram whose six angles are each filled with a similar standing figure. The figure

<sup>1</sup> Foucher 1905/22, p. 142 *et seq.* Foucher 1917, pp. 139—146.

<sup>2</sup> Foucher 1905/22, p. 144.

<sup>3</sup> Stein 1921, Pl. VI (Khotan). Stein 1921, Pl. XXVIII (Niya). Stein 1928, Pl. XXI & XXVI (Lou-lan).

<sup>4</sup> Le Coq, 1916, p. 18.

<sup>5</sup> Montell, p. 171, Pl. VI, 1.

inside the central hexagram cannot very well be definitely determined. Evidently it is a divinity whose one foot is placed on a prostrate human figure. The right arm is raised above the shoulder and holds an object, the left rests against the breast. The whole figure brings to mind a Lamaistic mandala. The central figure might be interpreted as a *dakini*, e. g. Simhavaktra.<sup>1</sup> The hexagram is borne and supported by another six female figures which may be considered as *yakshini*.

It is difficult to say how this remarkable object was used, but it should be pointed out that it greatly resembles the bone aprons that are still used by Tibetan Lama monks for certain ceremonies. The central figure, too, may be the same in both cases.<sup>2</sup> On the other hand, the object in the Hedin collection is much more richly ornamented and is made with greater finesse and in better agreement with Indian prototypes. Additional finds and more material for comparisons may perhaps in the future make possible a definite interpretation.

Sven Hedin's collection includes two dice of bone. They represent two types, Pl. VIII, 10, in agreement with our modern cube-shaped dice, and Pl. VIII, 14, which is rectangular. Stein has reported several finds of the first-mentioned type from Mazar-Tagh and Endere.<sup>3</sup> Marshall advises of some similar finds from old Indian culture.<sup>4</sup> In Sven Hedin's collection there is also a die made of stone of the same kind as the ones of bone described above.

Rectangular dice are mentioned from India<sup>5</sup> and China, and Stein reports a find from Lou-lan.<sup>6</sup> The specimen here reproduced is of a peculiar kind. All four sides of the die are divided into four fields by carved lines, each field containing the same numeral designation. Probably the side with 4 dots was counted as 1, that with 8 dots as 2, etc. Hoernle describes an interesting development of this type from the modern Kashmiris.<sup>7</sup>

An object of bone, whose purpose I cannot explain, is illustrated in Pl. VIII, 15. It is perhaps the handle of a tool, a large spoon or the like. The object is twice as thick at one edge as at the other. A very primitive human figure is engraved at the very top of the rounded point. Otherwise the decoration consists of circles with a dot in the middle.

### OBJECT OF MOTHER OF PEARL.

There is only one object made of this material in the collection, the little »fleur-de-lis«, Pl. VIII, 4. The object gives no indication as to its use, but it is reasonable to believe that it was a decoration of some sort.

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<sup>1</sup> Cf. Grünwedel 1900, fig. 149.

<sup>2</sup> Waddell, p. 75, Tucci & Ghersi, Pl. to p. 202. Bossert, p. 287.

<sup>3</sup> Stein 1907, Pl. LII. Stein 1928, Pl. VI.

<sup>4</sup> Marshall 1931, Pl. CLIII, 7—10.

<sup>5</sup> Culin, p. 76.

<sup>6</sup> Stein 1921, Pl. XXXVI.

<sup>7</sup> Hoernle 1899, p. 44.



# APPENDIX

BY

HELMER SMITH

The manuscript leaves found by Dr Hedin in 1896 (see *En färd genom Asien* II, p. 96 and cp. G. Montell, *Sven Hedin's archaeological collections from Khotan* I, p. 151) have been reproduced, on Pl. IX—X, from Dr Hedin's photos, as it proved impossible to make out where the originals are hidden at present. We do not expect Saka scholars to take much interest in a fragment about the merit of learning and preaching a certain *sūtra* (Pl. IX), cp. for inst. E. Leumann, *Nebenstücke* 20<sup>48</sup> sqq. = S. Konow, *Saka Studies* 84<sup>10</sup> sqq.; nor will the sanskrit fragment (Pl. X) teach us anything new about the *pāramilās*. We only hope that someone of the experts in buddhology kindly will take the pains of replacing the fragments in their original setting and, accordingly, correct my mistakes, which would have been more numerous without the kind help of Professor Sten Konow of Oslo.

## Pl. IX

Leaf from a Saka *sūtra*; 5 lines; about 22 *akṣaras*; folio number 10 (?) on the left side of the obverse margin.

### Obverse (IX a)

⟨d⟩ijsāte • auyā vāṣīyā auyā paṣimyañña haṃtsa arthāna hvāñīyā  
ṣi tyau puṇyau atisaṃdai himi hastamñi balysūstejsa • pātcā Maṃnyuśrī  
aḷysāṃnai tta hvetā si ṣe sūtrā diṣi diṣi birāṣāṃñā ā vā  
ne ślātā tvī ⟨bi⟩śśā uysnaura pyūṣṭā yanidā • pātcā Maṃnyuśrī a-  
lysāṃnai tta hve si ci ttū dātā śau jūna vāṣīyā tte uysāṇe rakṣa •

### Reverse (IX b)

cvī ṣe jūṃna vāṣi tye biśśā ru tcārīmi rakṣa cai drai jūṃna vāṣīyā bi-  
śānu ysañinu busvārāṇā rakṣa • cvai tcāhau jūṃna vāṣītā harbi-  
śye kṣīrā rakṣa • cvai paṃjsa jūṃna vāṣītā biśānu balysañā-  
nu rudinu rakṣa • pātcā Maṃnyuśrī alysāṃnai tta hvetā si • ṣi dātā  
arthānā(?) biśvā kṣīrañvā haurāṃñā kāmī ttitā × kāmī hvatā

### Translation

(if) he would commit (this *sūtra*) to memory, or read it or propound it together with its meaning (ṇ: commenting upon it) in the midst of an assembly, by these merits he will become a non-returner from (his way towards) the supreme *Bodhi*. Then Mañjuśrī kumārabhūta spoke thus, namely: this *sūtra* should be propounded all about the world or (if) not, . . . ,<sup>1</sup> (that) all beings may hear it. Then Mañjuśrī

<sup>1</sup> *Ślā(ka)* 'feasible', Konow (see NTFS XI 76<sup>27</sup>, against M. Leumann, Glossar 503).

kumārabhūta spoke thus, namely: whoever should read this *dharma* once, his is (ꣳ: he brings about) protection for himself; whoever should read it twice, his is protection for his whole field of activity; whoever should read it three times, his is protection for all relatives (and) kinsmen; whoever should read it four times, his is protection for the whole country; whoever should read it five times, his is protection for all district chiefs (and) kings [read: *rumḍinu*]. Then Mañjuśrī kumārabhūta spoke thus, namely: this *dharma* (together with its?) meaning should be delivered to all countries. Who . . . , who . . .

Pl. X

Sanskrit fragment (Prajñāpāramitā), being the right part of a folio of, originally, 8 lines at least, with about 40 *akṣaras*; there are more or less legible remains of six lines (maximum 23 *akṣaras* in succession). The transcript fills up interior gaps, but refrains from conjectures as to the great lacunæ and makes no attempt to fit into the context the (on photo overturned) tatter to the left (6 lines, max. 4 *akṣ.*).

Obverse (X a)<sup>1</sup>

— — na — —  
 — — — × samjñāṃ — —  
 — — rabhūte × × tv(o) ma — —  
 — — — <pratisaṃyuktena> cittenānityākāreṇa pratyavekṣa-  
 — — — × jñā × sarvākārajñā<tāpra>tiṣaṃyuktena cittenānityā-  
 — — — <tac ca nōpalabha>te bodhisatvasya mahāsatvasya prajñāpāramitāyāṃ cara-  
 — — — <bodhisatva>syā mahāsatvasya prajñāpāramitāyāṃ cara × taḥ sarvākārajñā-  
 — — — <ākāre>ṇa pratyavekṣate tac ca nōpalabhate evaṃ vedanāṃ samjñā saṃskārā-

Reverse (X b)

— — <tac ca nō>palabhate • peyālaṃ rūpaṃ nairātmyākāreṇa pratyavekṣati tac ca nō-  
 — — <veda>nāṃ nairātmyākāreṇa pratyavekṣati tac ca nōpalabhate • punar a-  
 — — — <pārami>tāyāṃ carataḥ sarvākārajñātaḥ pratisaṃyuktena ci-  
 — — — evaṃ vedanāṃ samjñāṃ <saṃskārā>n vijñā<nam a>nityataḥ pratyave-  
 — — — tac ca nō<palabha>te • evaṃ vedanāṃ samjñāṃ <saṃ>-  
 — — no pa apraṇi × ta — —  
 — — × × — —  
 — — × — —

<sup>1</sup> To Professor Konow who informs me (Sept. 19th 1938) that he knows close parallels to the fragment and will utilize it in a forthcoming study on Serindian Prajñāpāramitās, I am indebted for the readings *Subhūte* (Obv. 1, 3, my *rabhūte*), and *punar a<param>* (Rev. 1. 2 last *akṣaras*, where I at first saw *avara*-).

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- Pl. I, 1 a—c (03.11. 344). Bronze image of Buddha, who is seen seated, feet drawn up, soles visible, Pl. I, 1c. No details of his dress visible except a few folds of the cloak and an ornament round the neck. At the back there have been two flat tenons, pierced for the string. The upper one is broken. Cf. text p. 84. Height 7.4 cm. Max width 5.6 cm. This figure possibly includes the aureole of bronze, Pl. I. 1b, consisting of a relief with 7 images of Buddha. Supplied with two holes so that it can be attached to the above figure. Height 16 cm. Max. width 11.7 cm.
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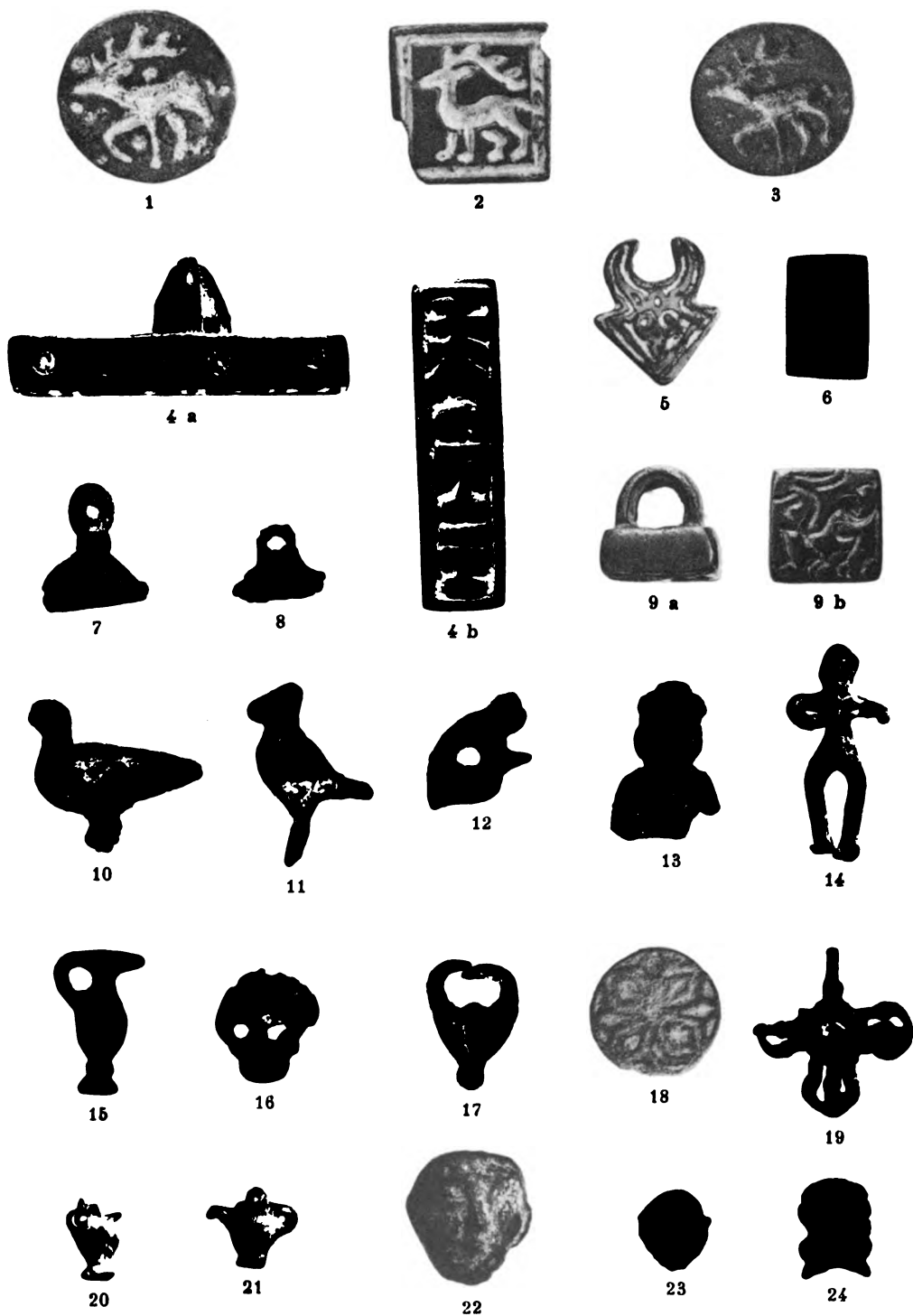


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b



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